US005447480A

United States Patent [19]

Fulks

[11] **Patent Number: 5,447,480**

[45] **Date of Patent: Sep. 5, 1995**

[54] **WEIGHT LIFTING MACHINE**

[76] Inventor: **Kent Fulks**, 9710 Amberly Dr., Dallas, Tex. 75243

[21] Appl. No.: **34,734**

[22] Filed: **Mar. 19, 1993**

[51] **Int. Cl.**[6] **A63B 21/06**

[52] **U.S. Cl.** **482/99**; 482/100; 482/133; 482/137; 482/138

[58] **Field of Search** 482/97–103, 482/130, 133–138, 142, 908

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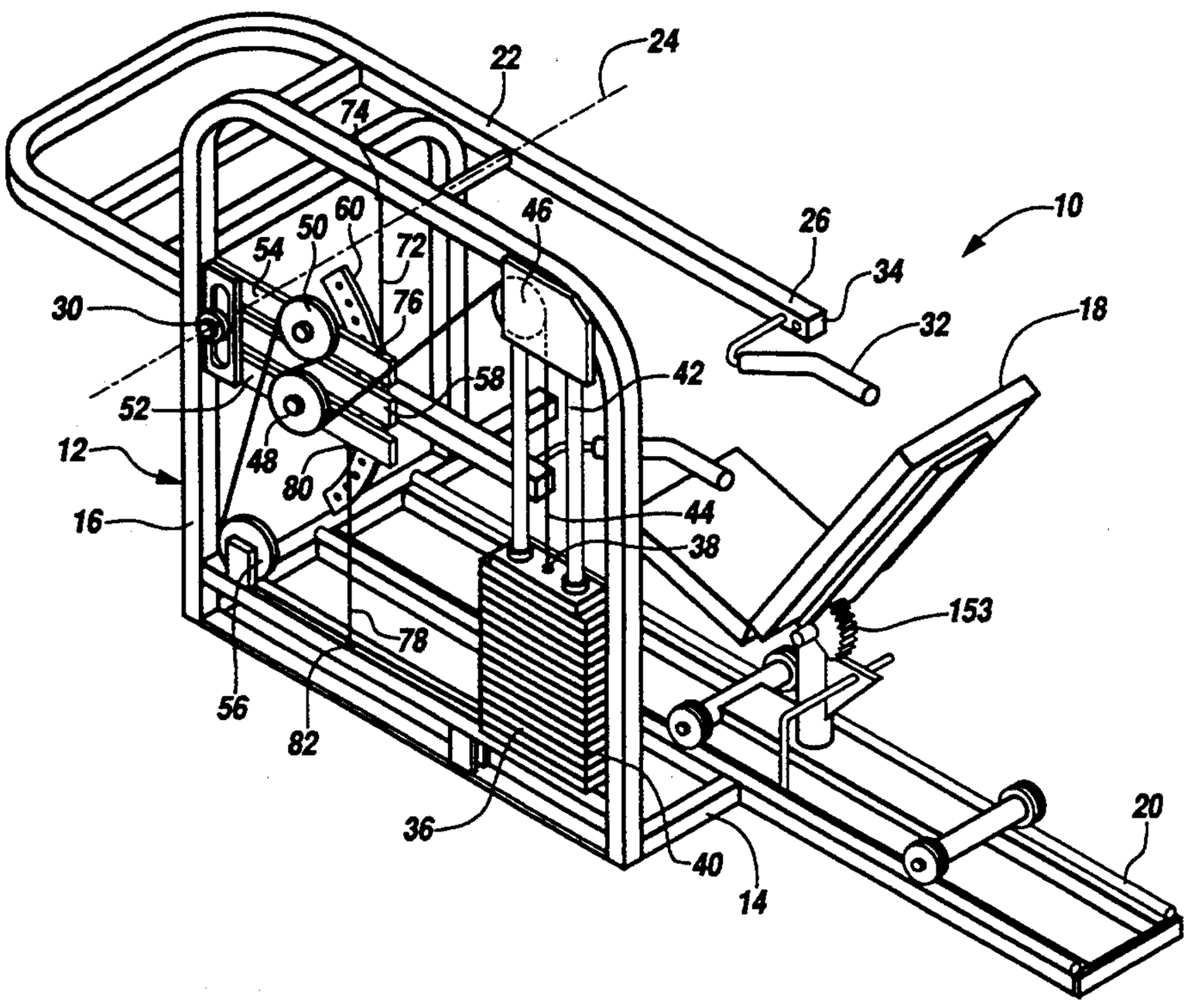
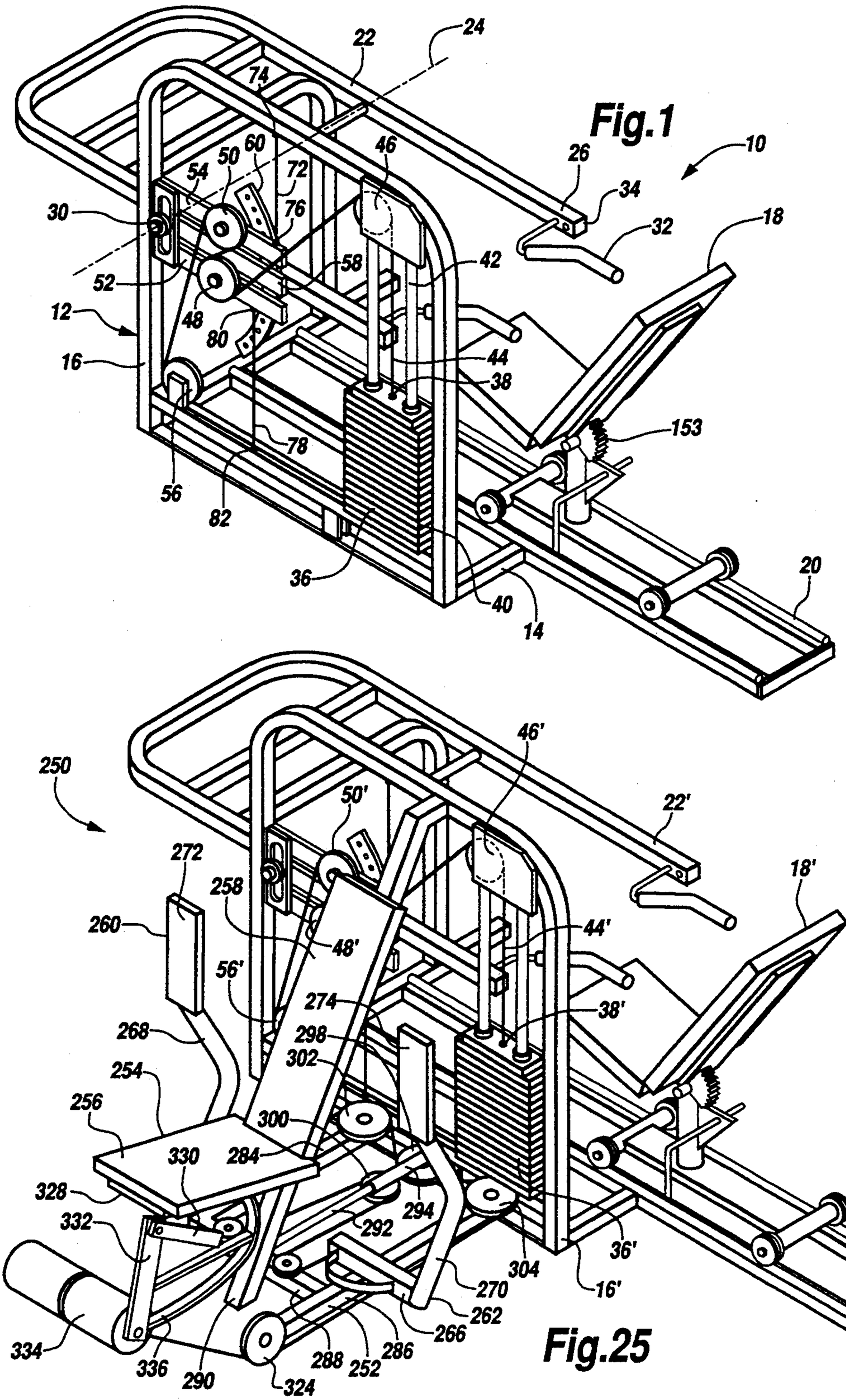
[57] **ABSTRACT**

A weight lifting machine for performing a wide range of exercises, has a lift bar angularly adjustable for a starting lift position angularly upward or downward of a substantially horizontal position. An actuating bar is connected to the lift bar for movement therewith. First and second pulleys are movably mounted above and below the actuating bar such that the first pulley moves upwardly with the actuating bar and the second pulley moves downwardly with the actuating bar. The first pulley is prevented from moving downwardly when the second pulley is moved downwardly with the actuating bar and the second pulley is likewise prevented from moving upwardly when the first pulley is moved upwardly. A lift cable is threaded through the first and second pulleys such that movement of the lift bar in either direction lengthens the distance between the pulleys, thereby lifting a plate-type weight stack. The machine is also equipped with butterfly bars and a leg extension, with the lift bar, butterfly bars and leg extension all connected to the weight stack through a single lift cable.

16 Claims, 11 Drawing Sheets

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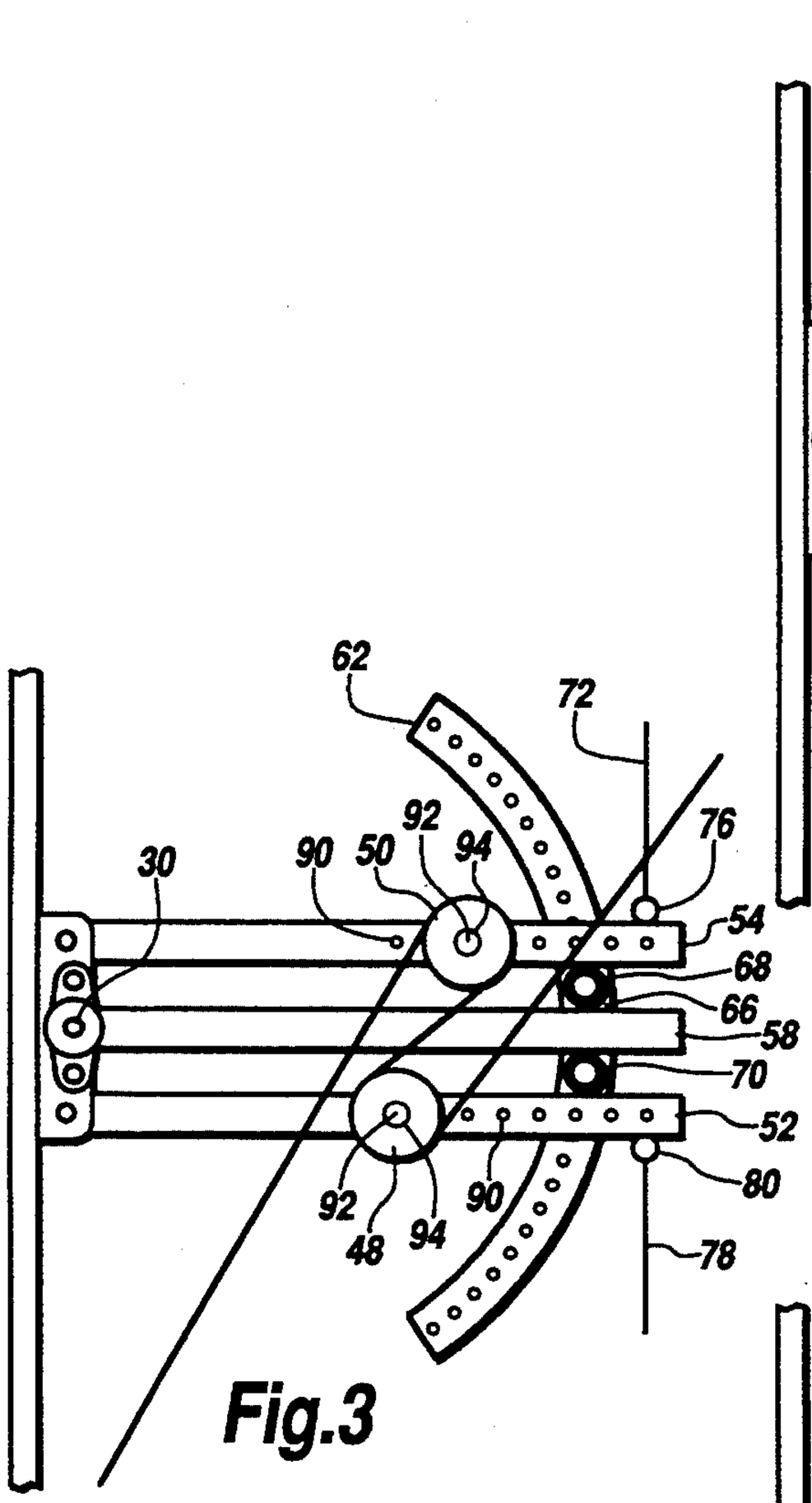

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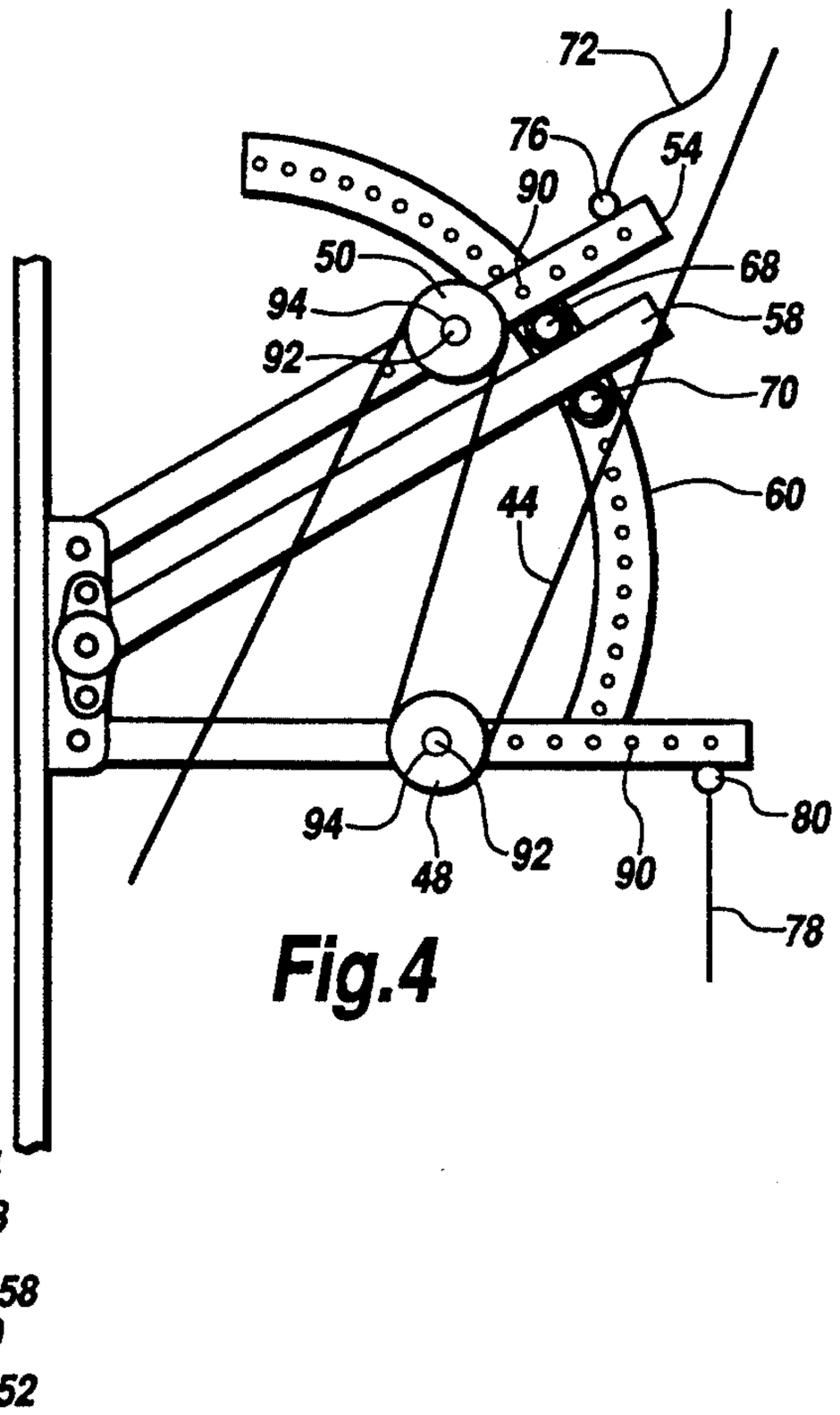

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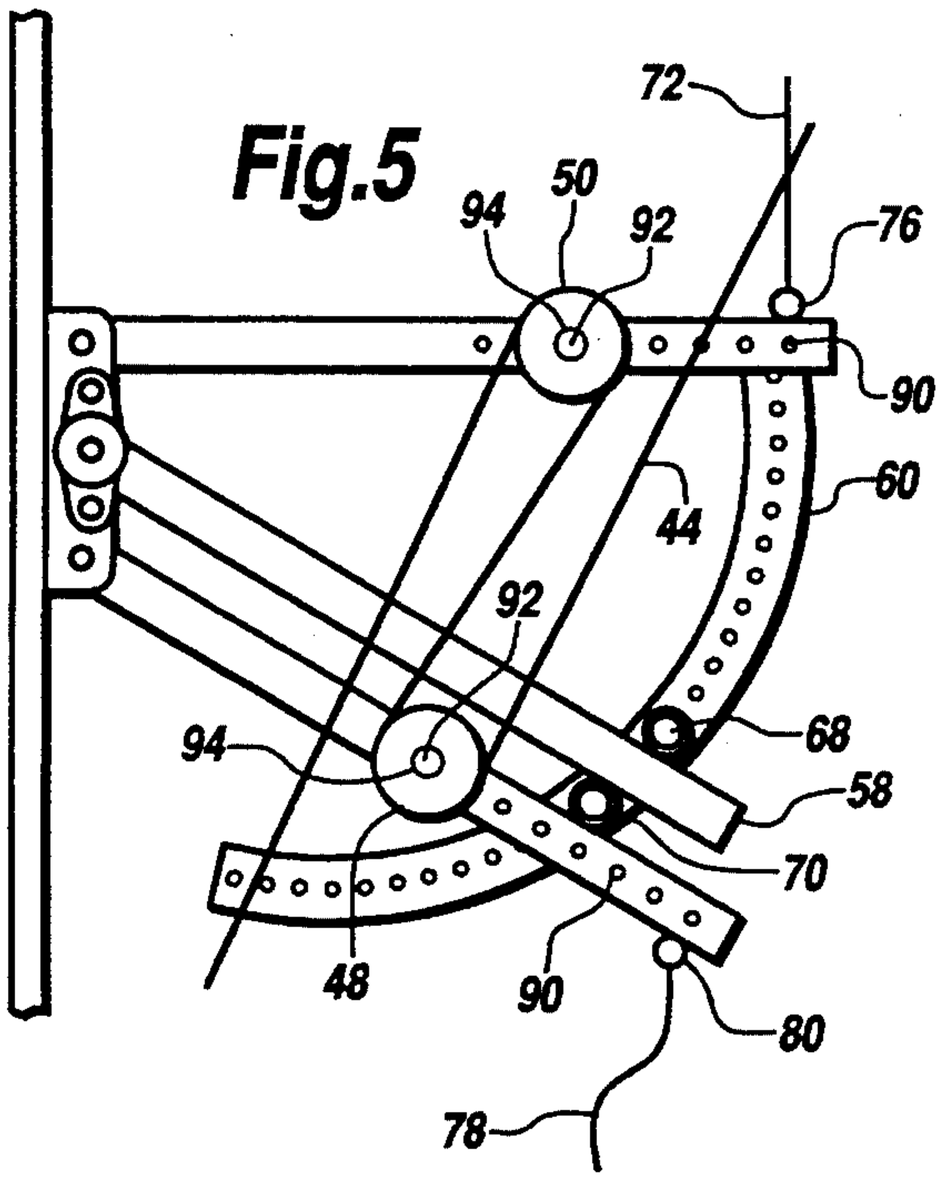

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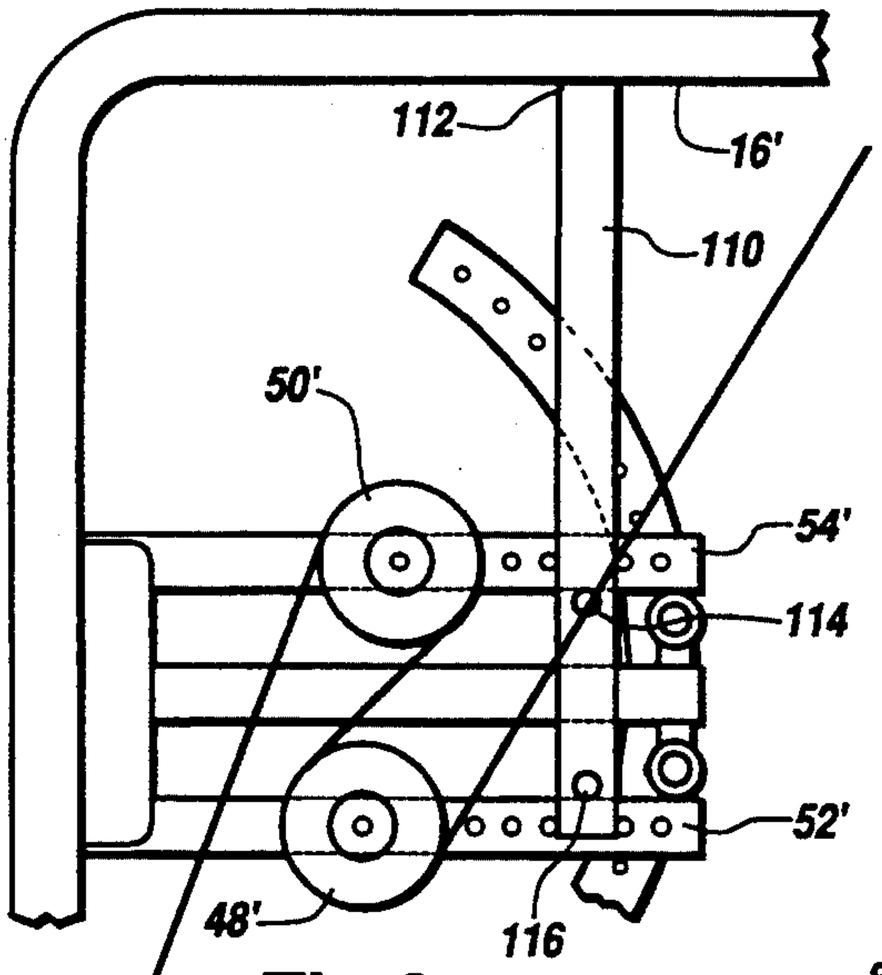


Fig.9

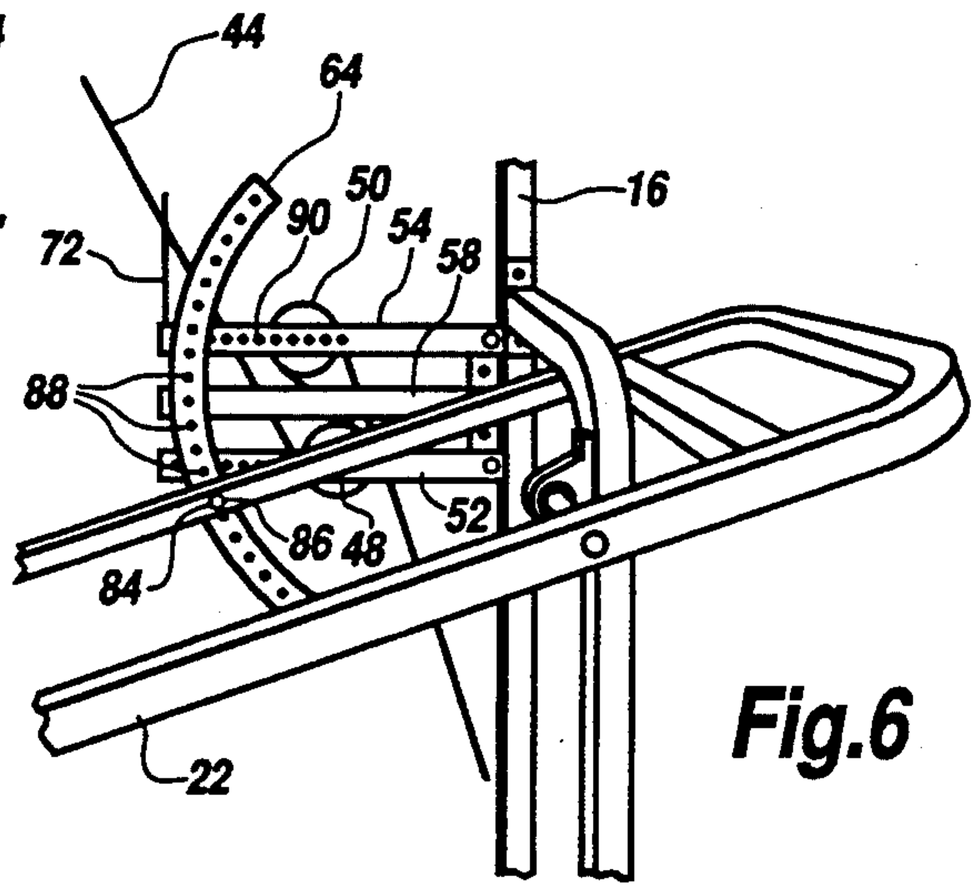
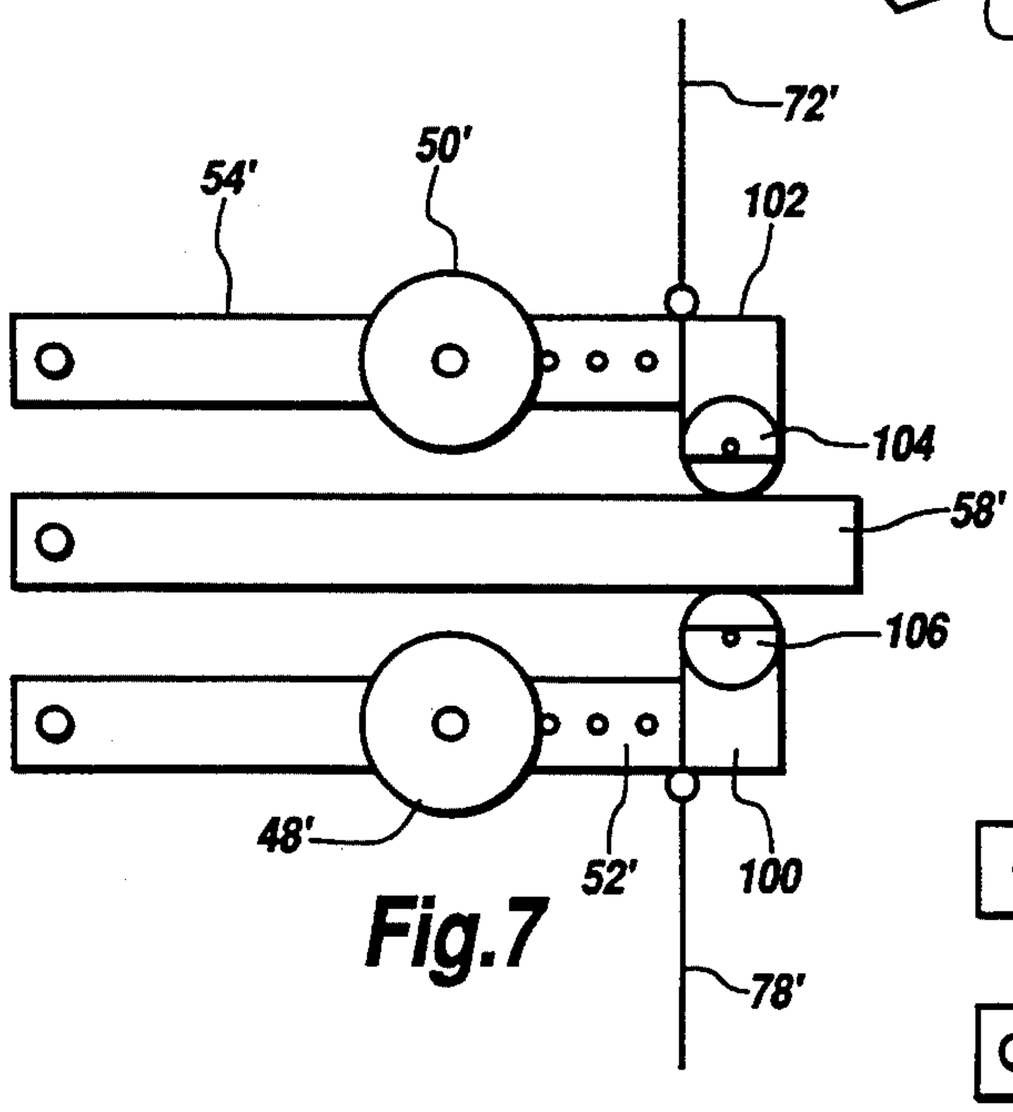


Fig.6



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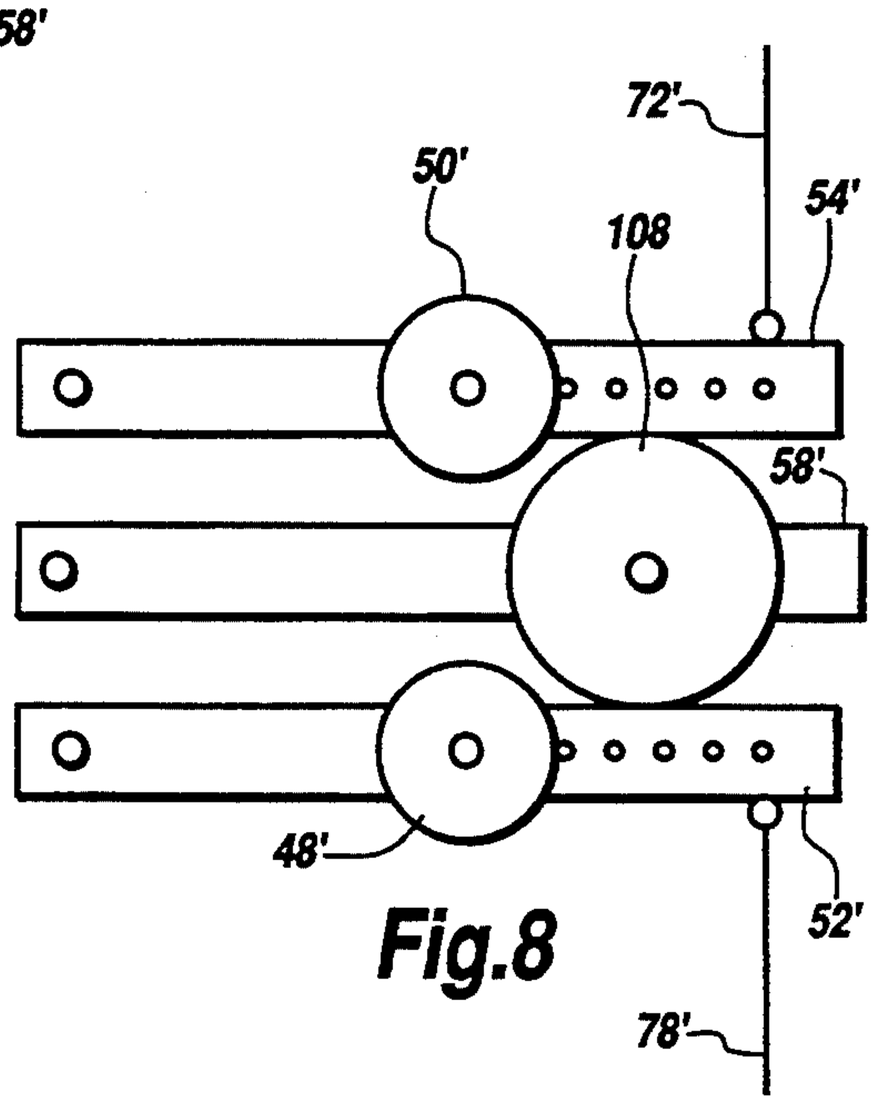

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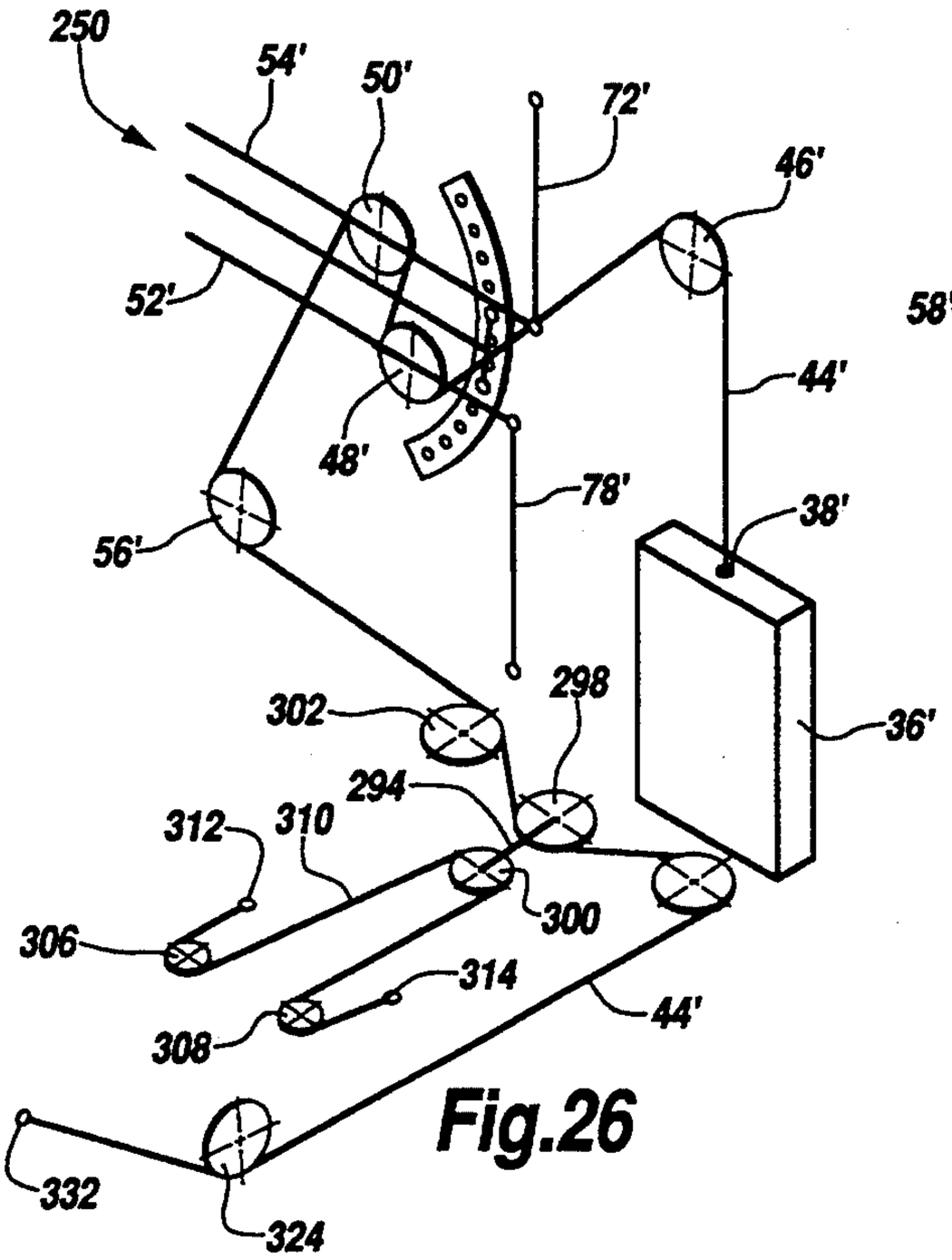

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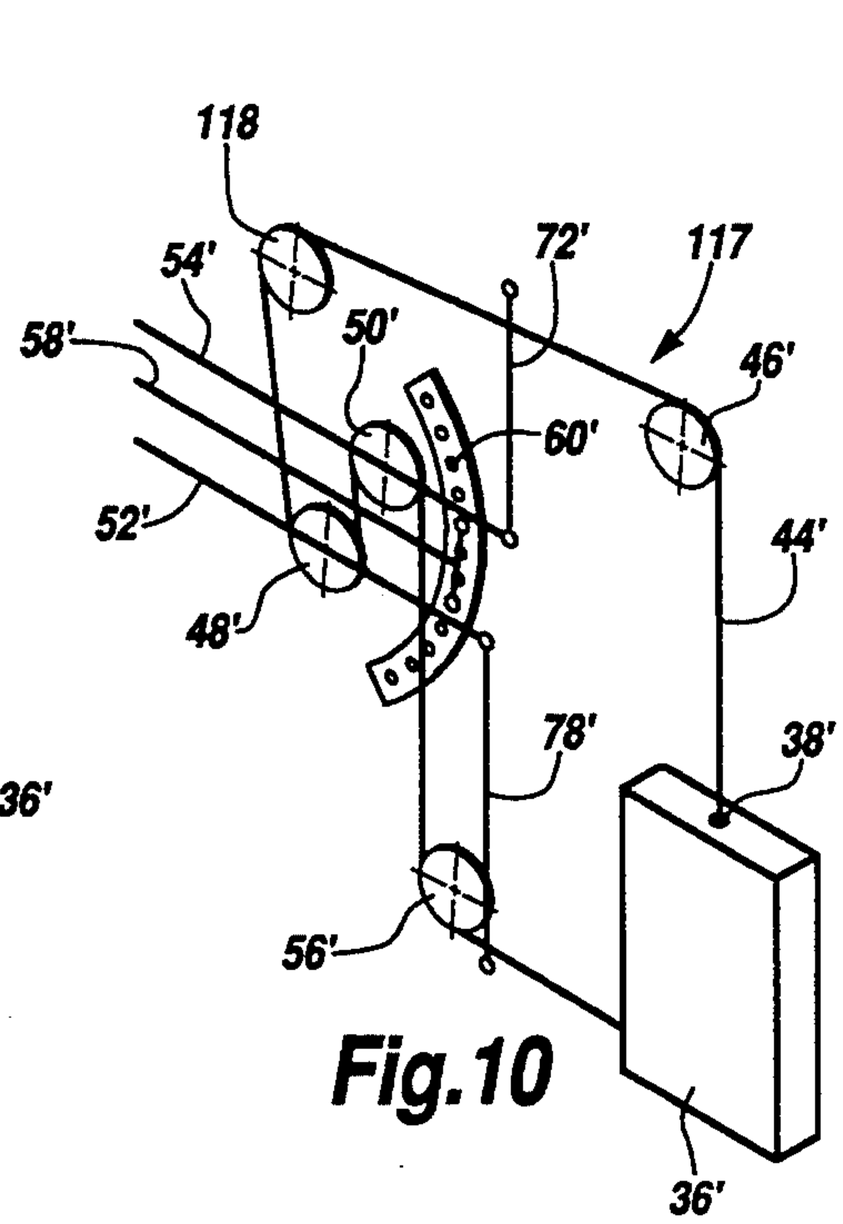

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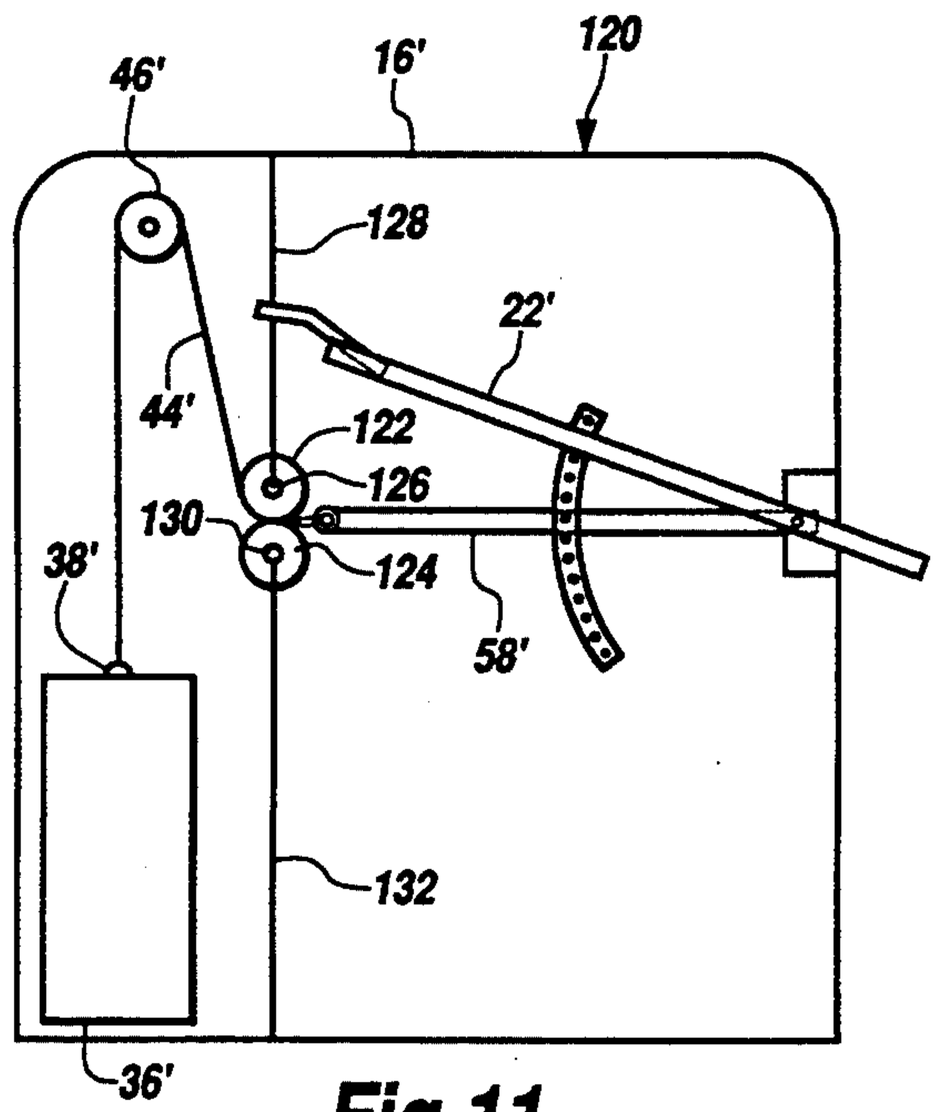

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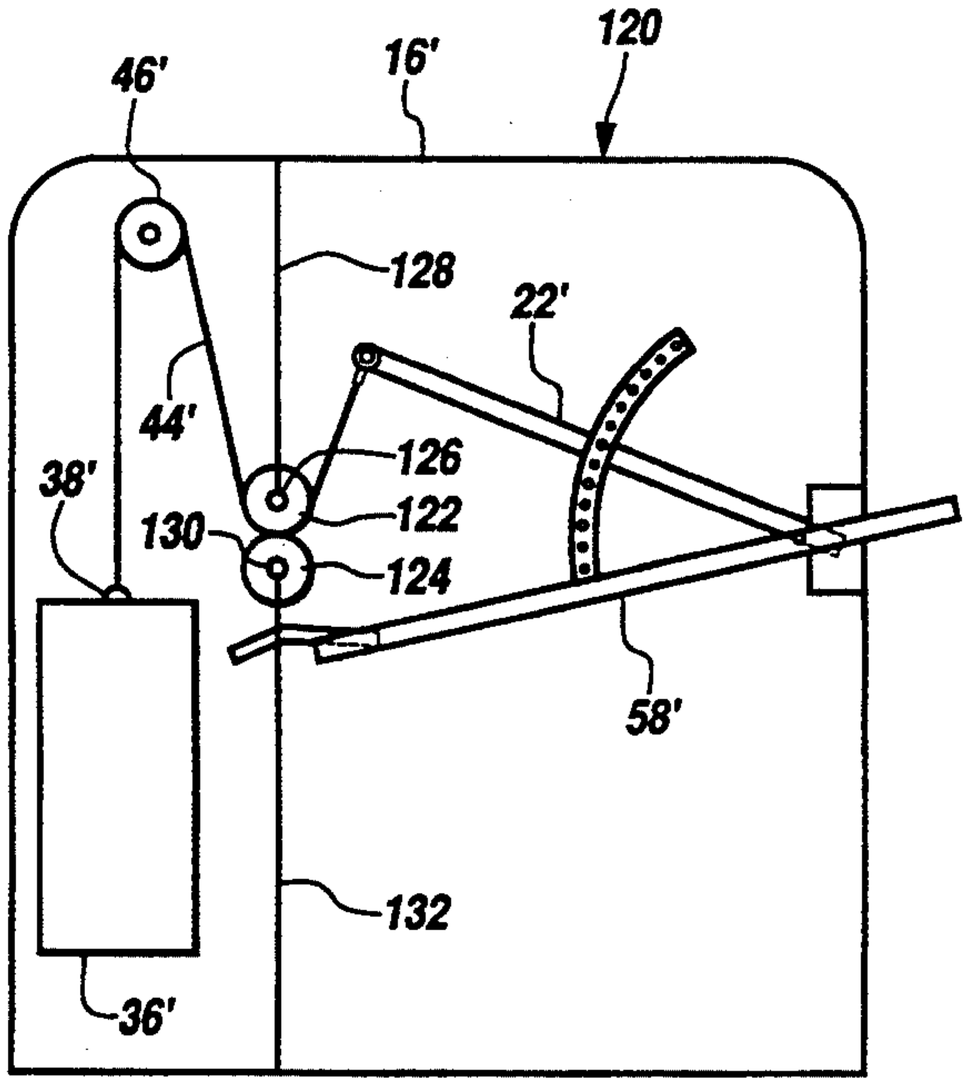

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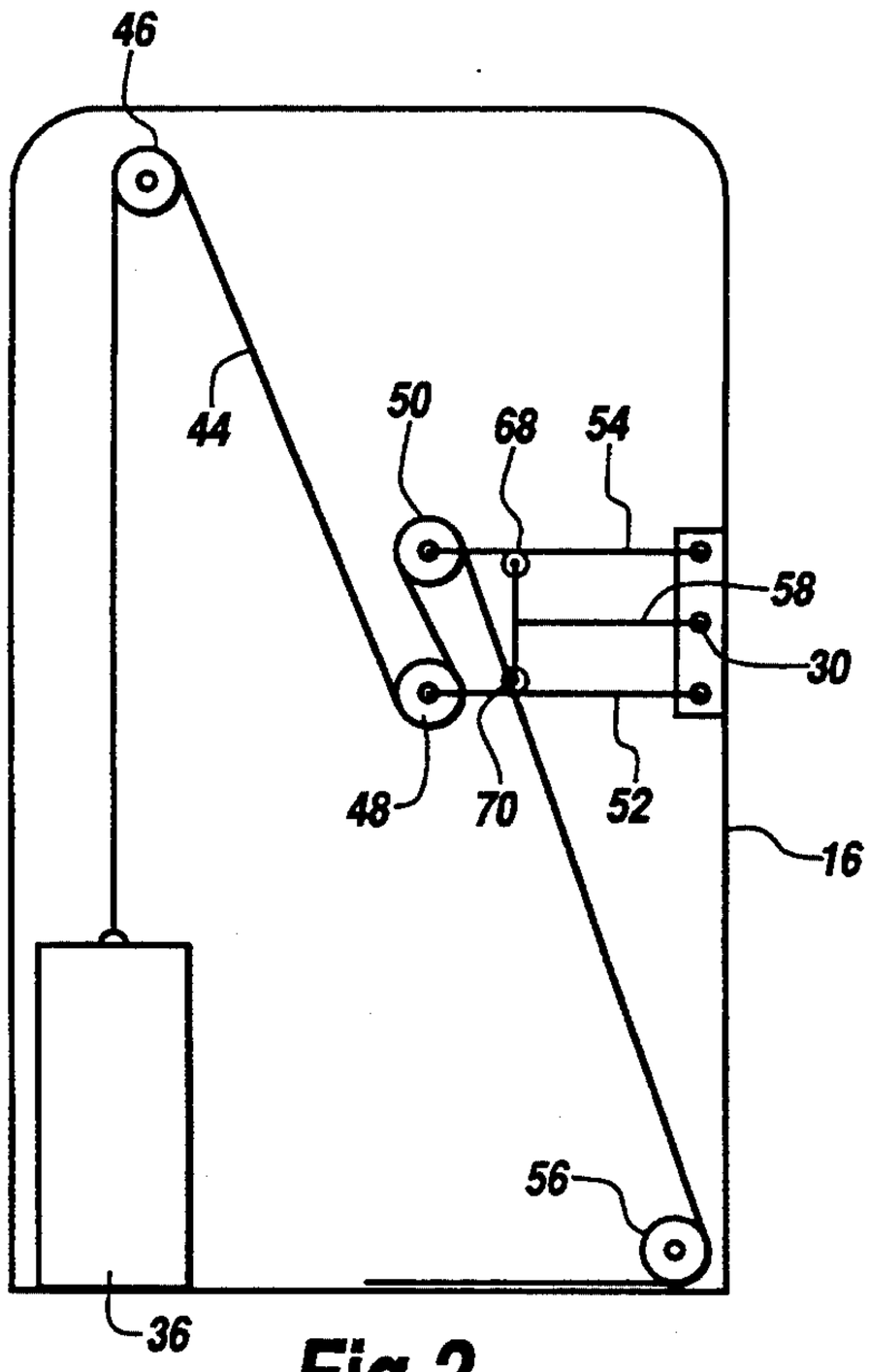

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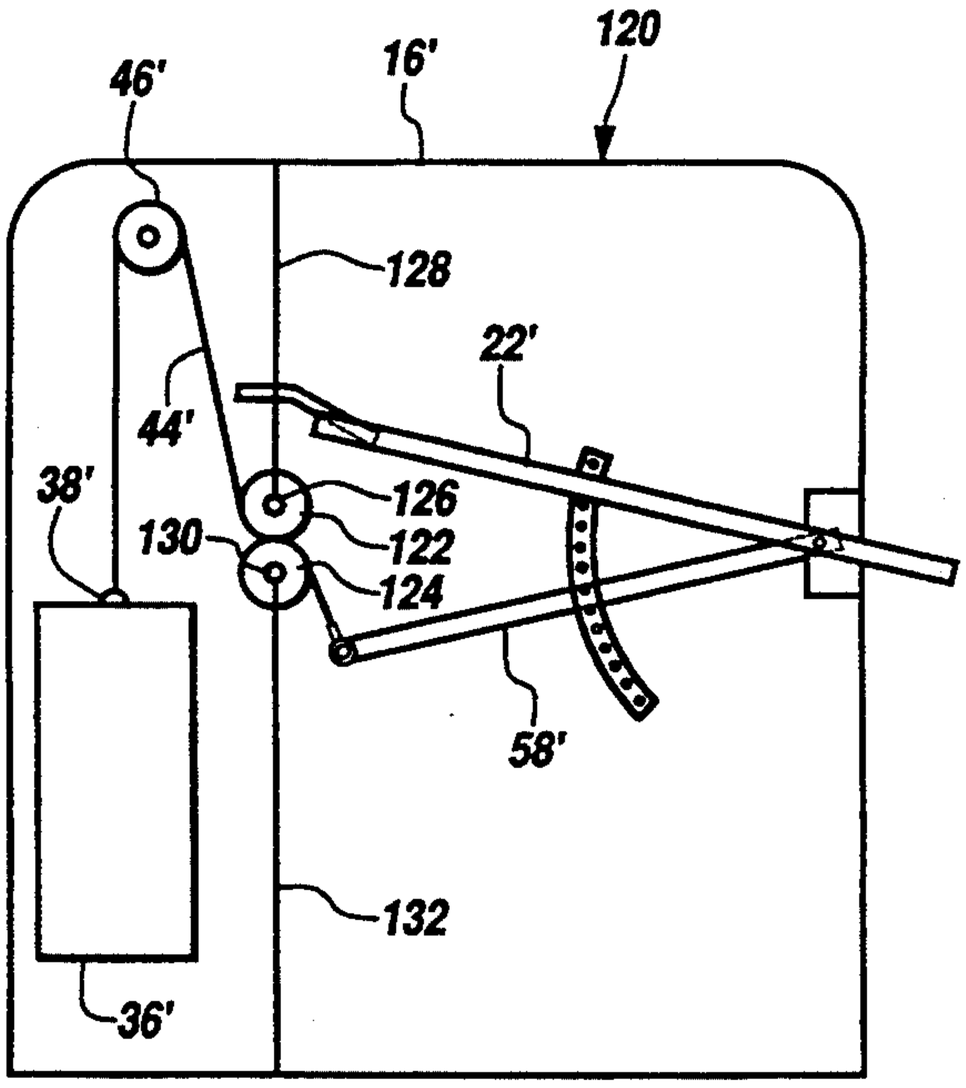

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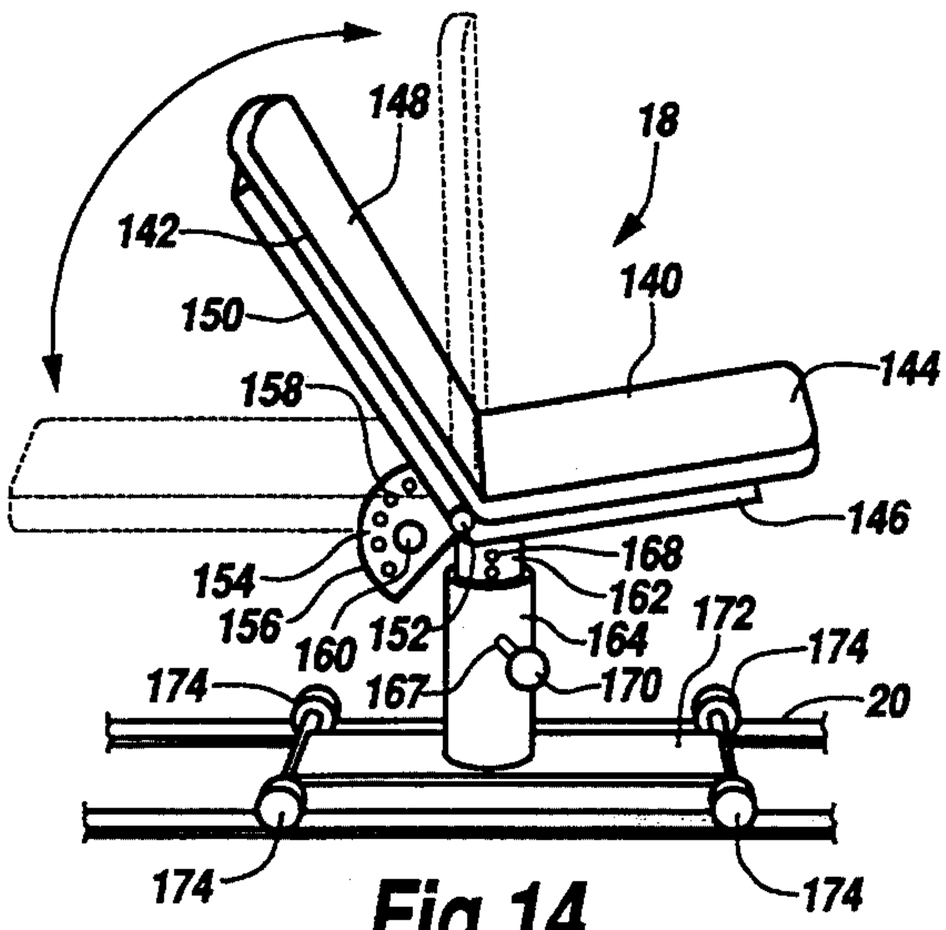

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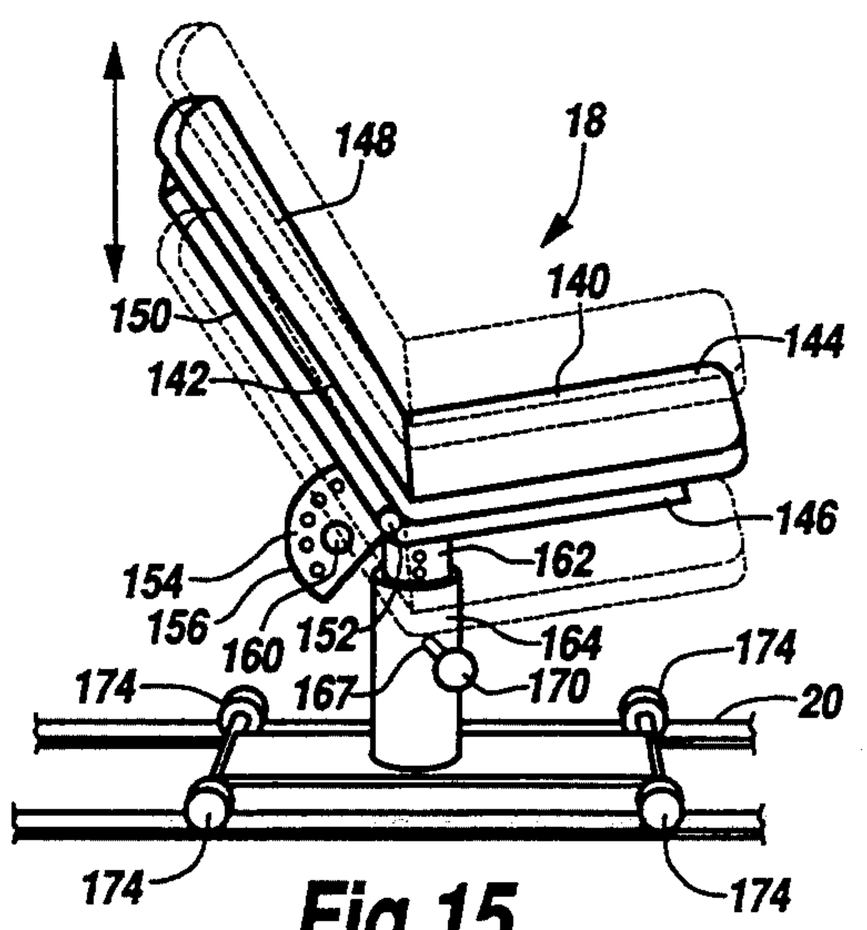

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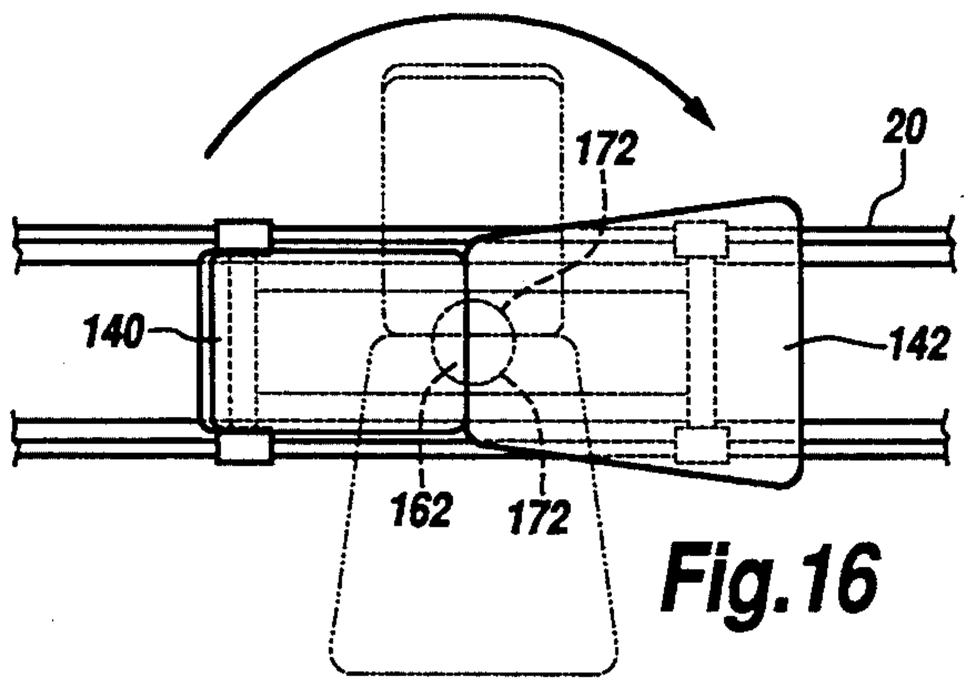

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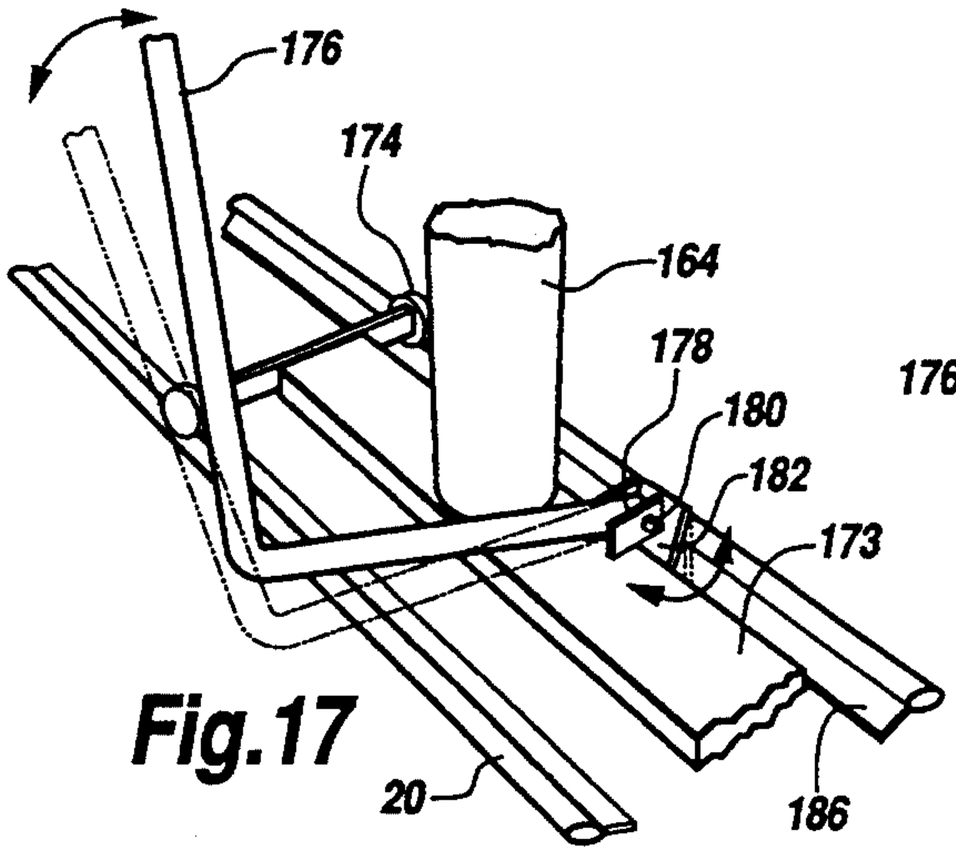

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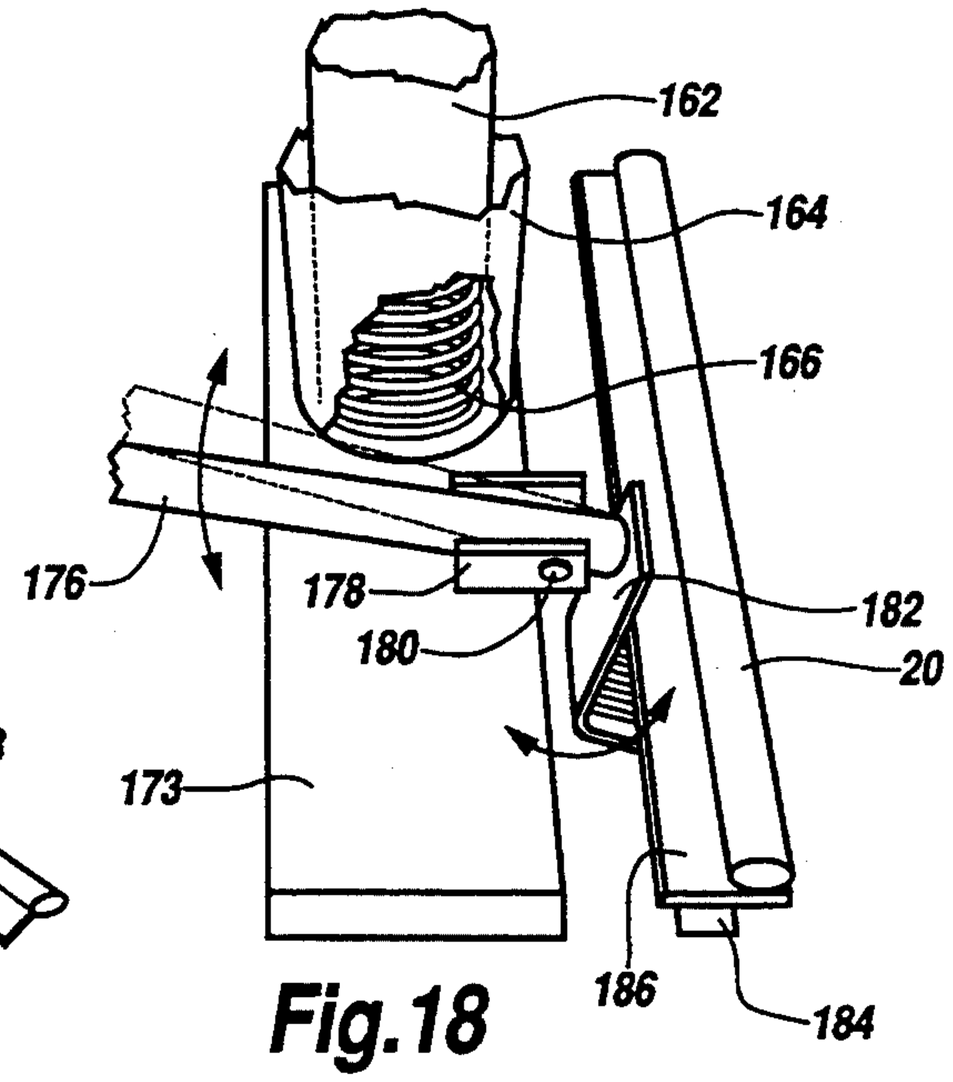

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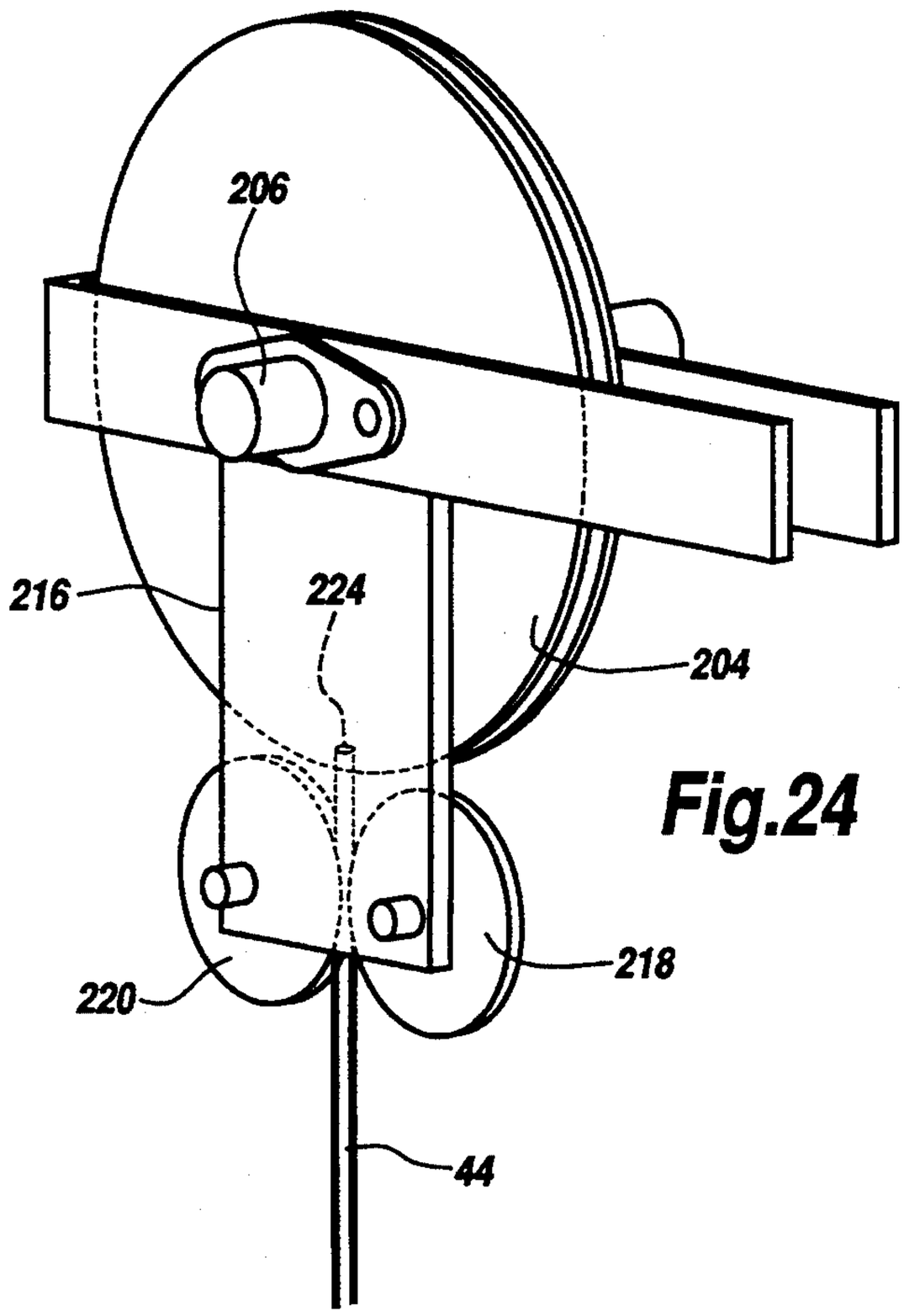

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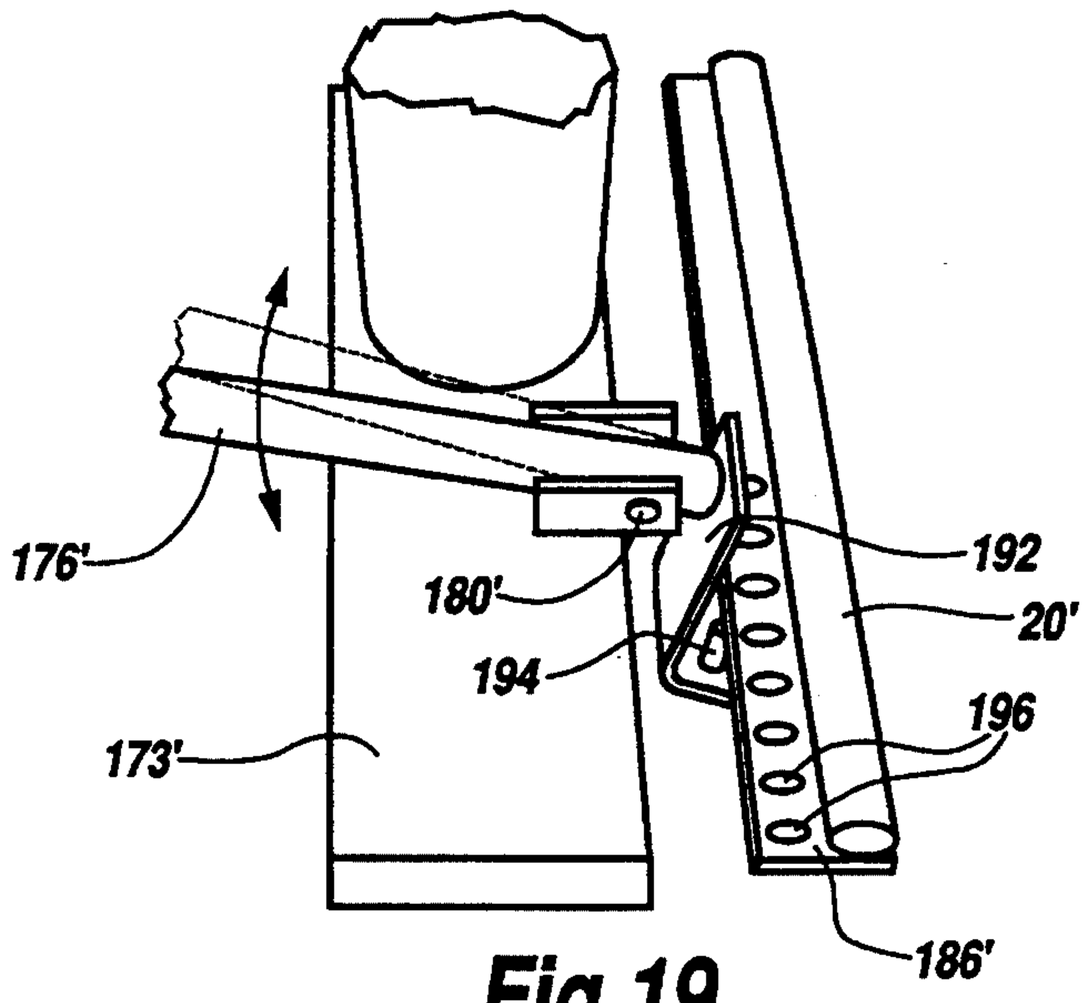

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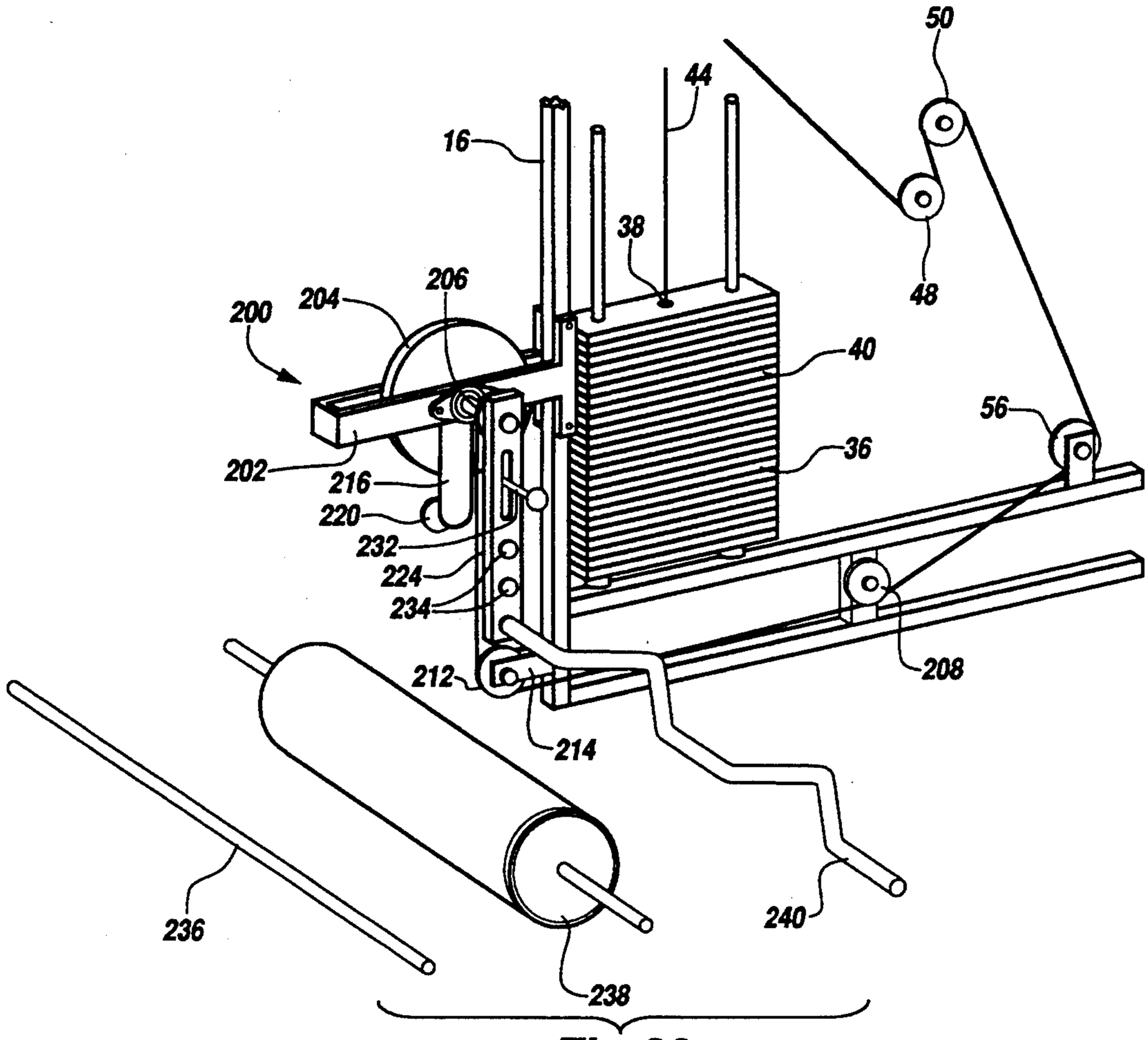

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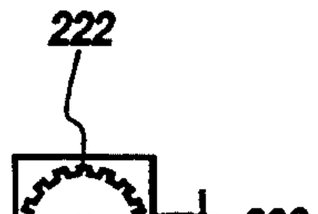

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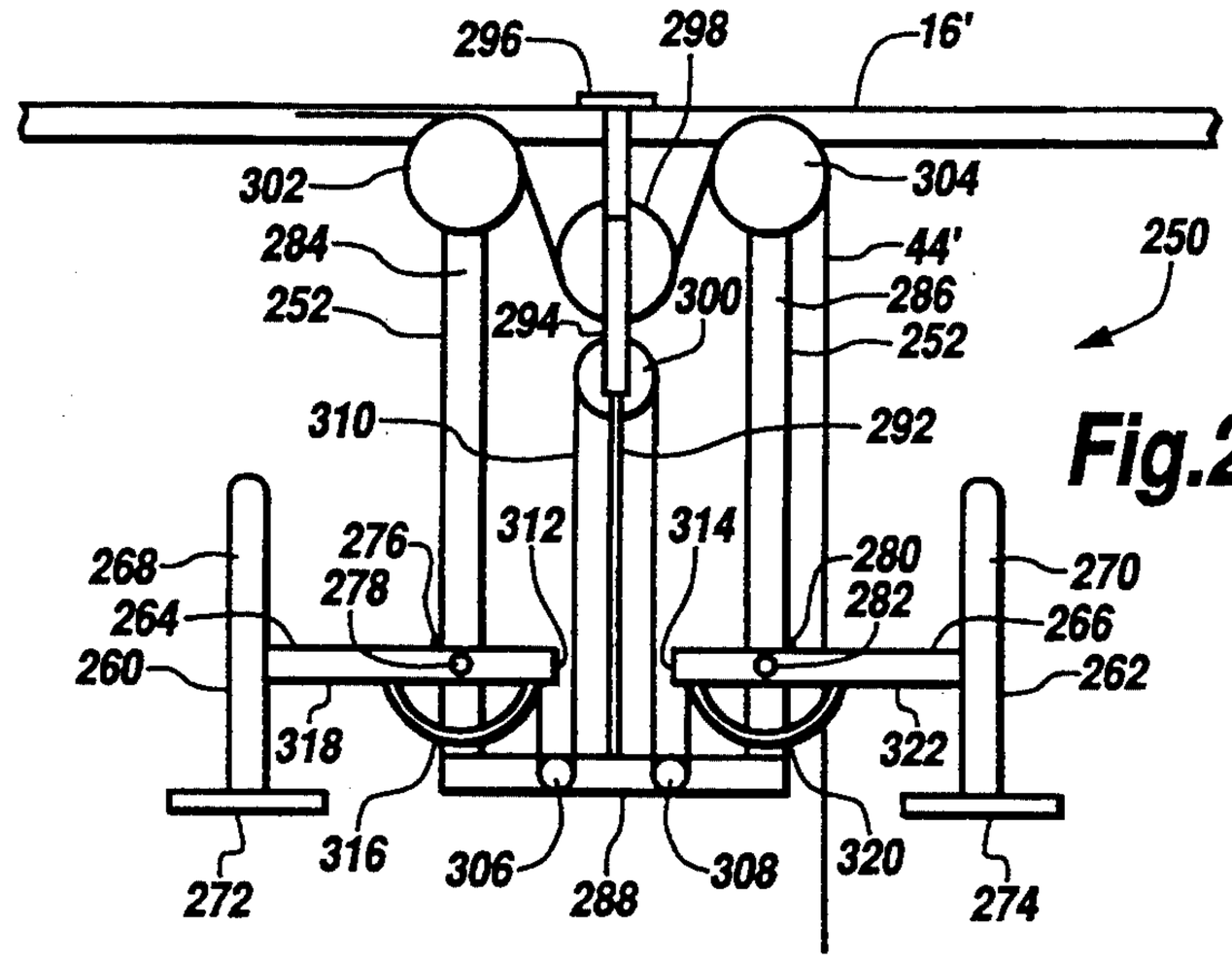

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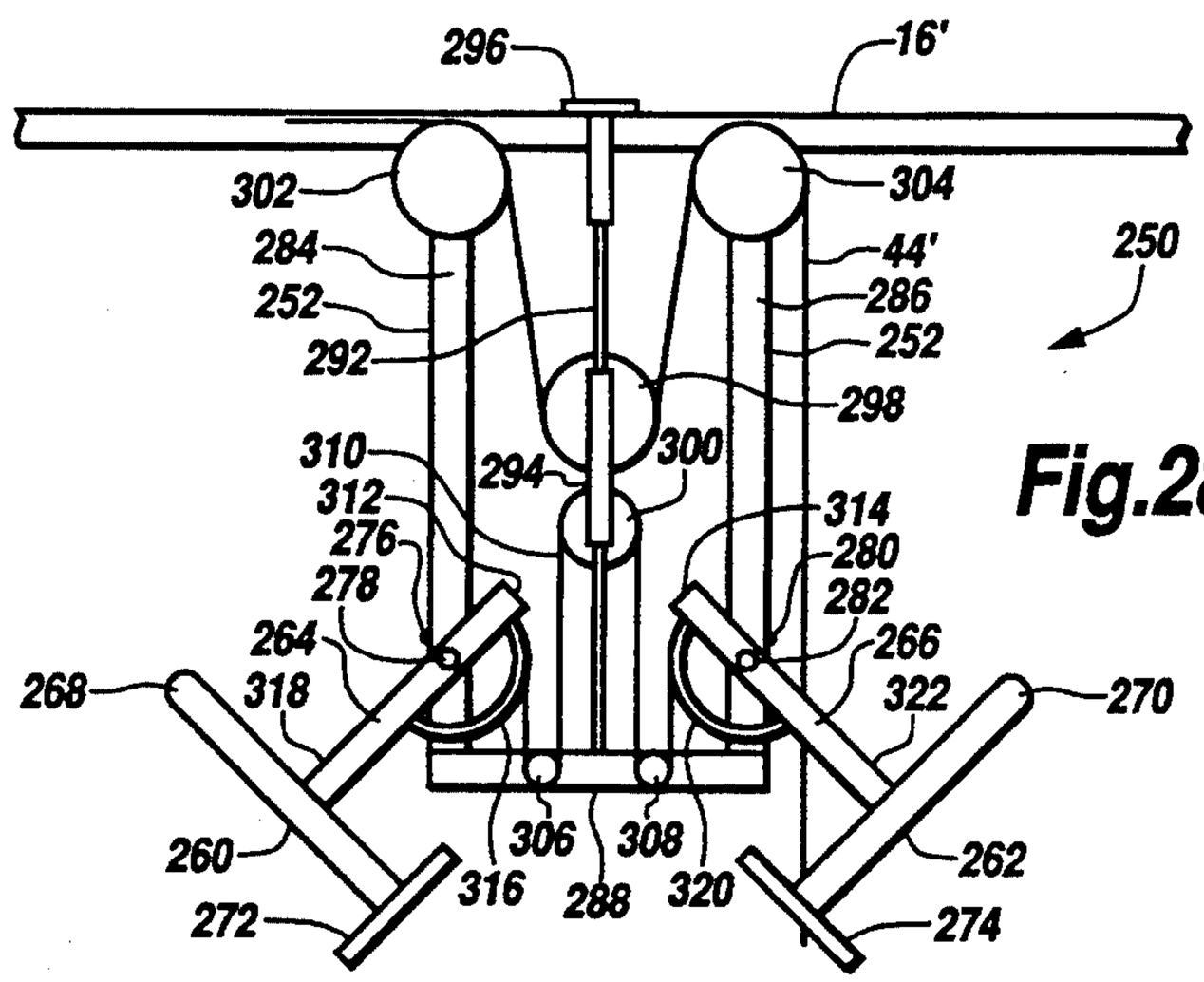

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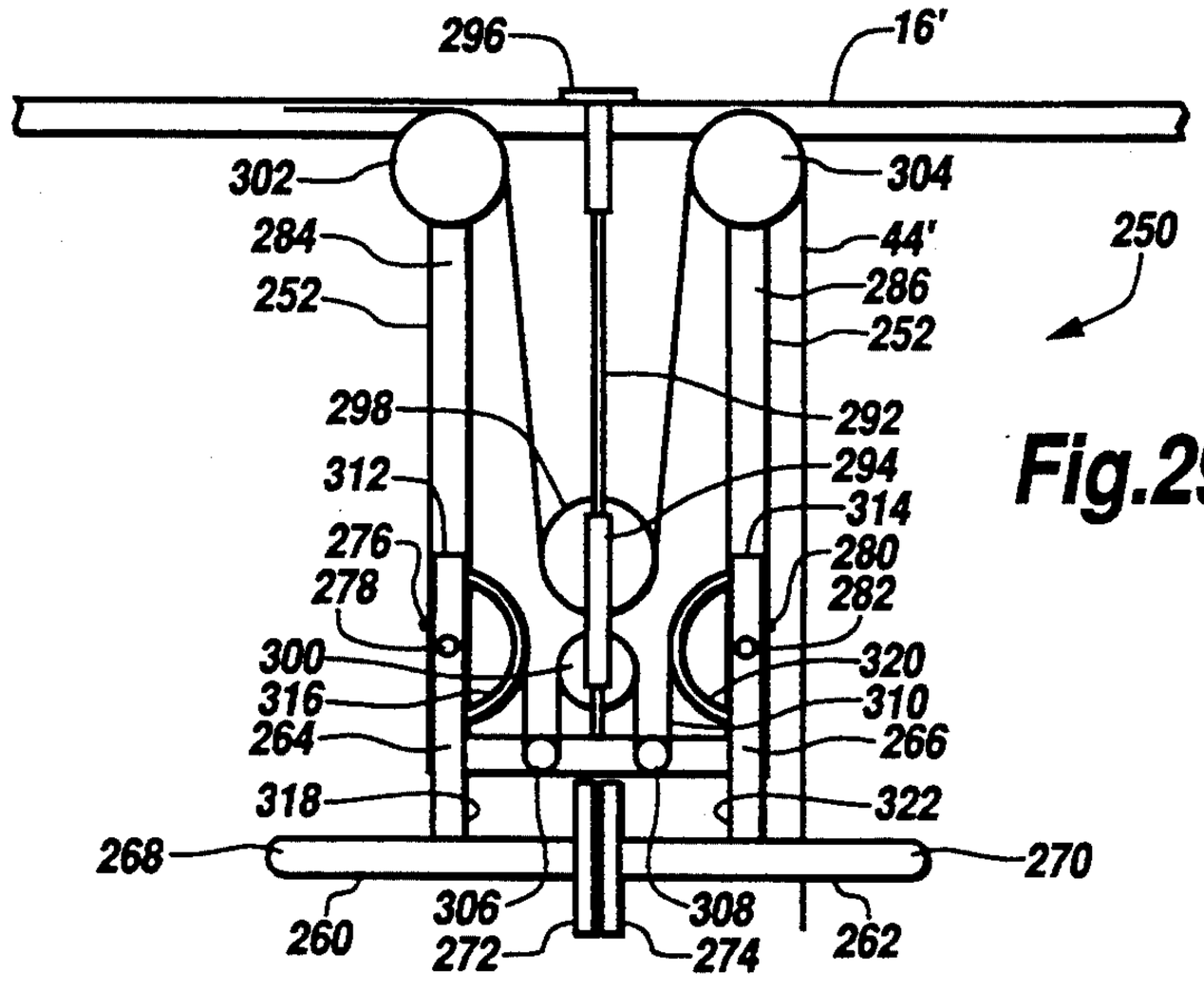

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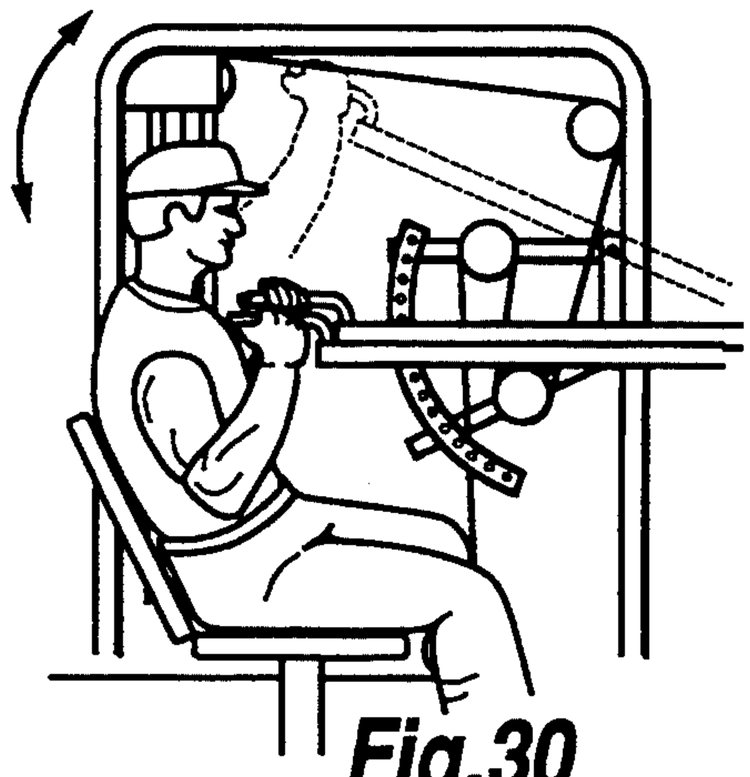

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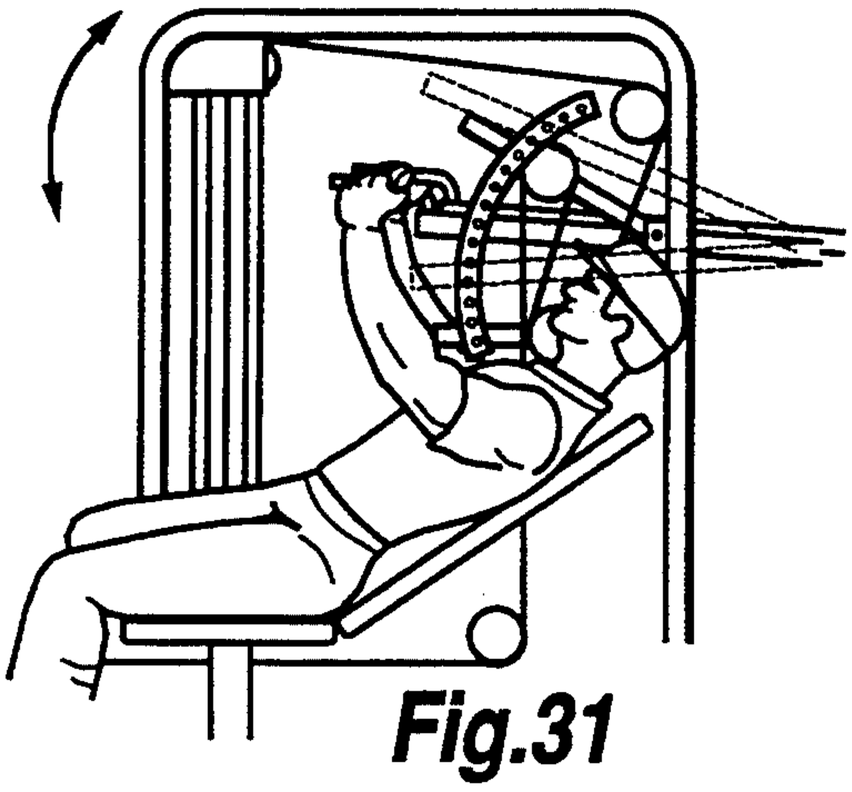

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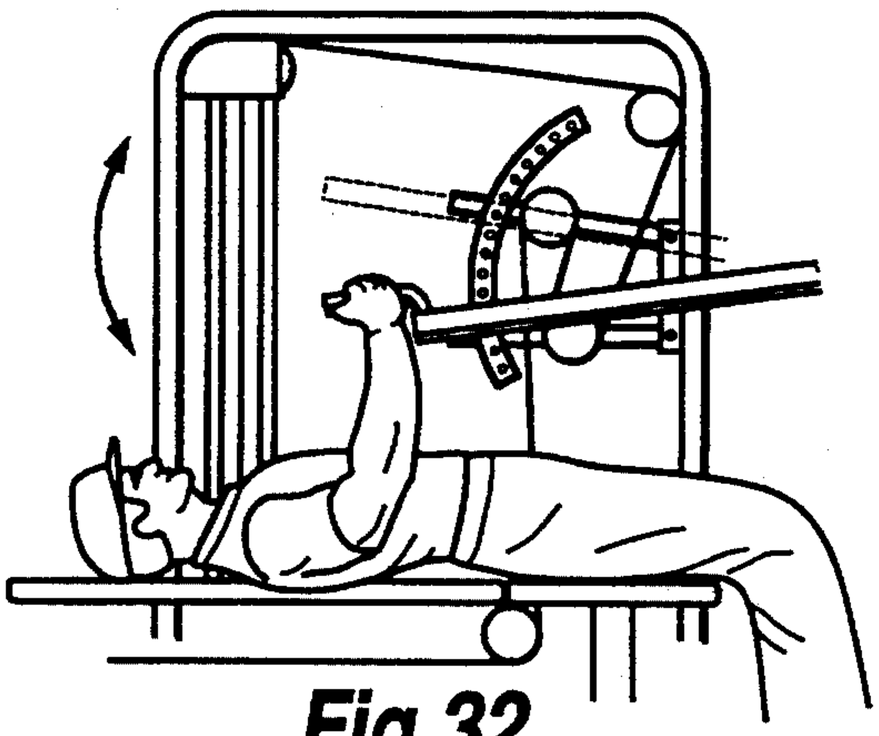

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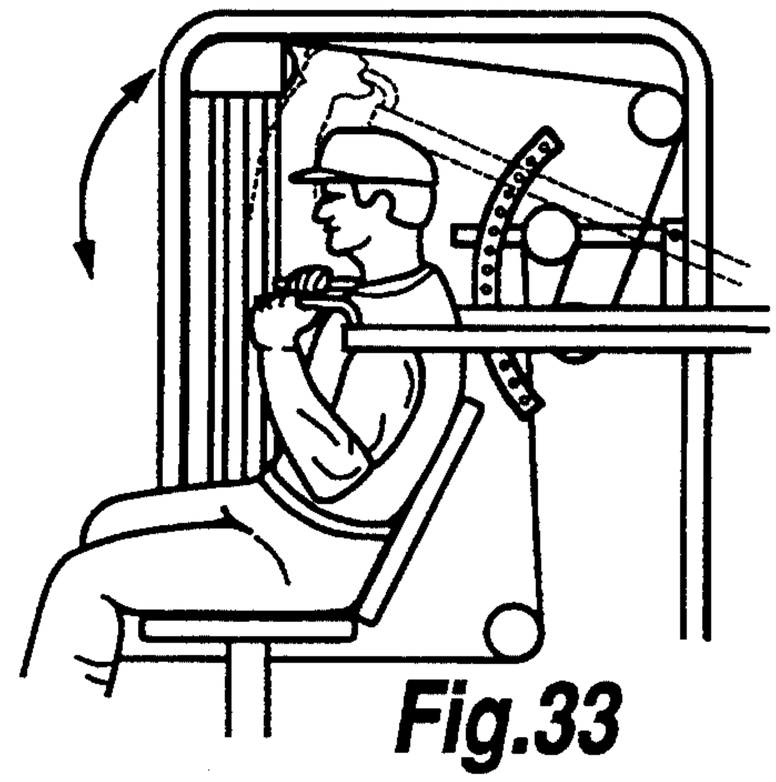

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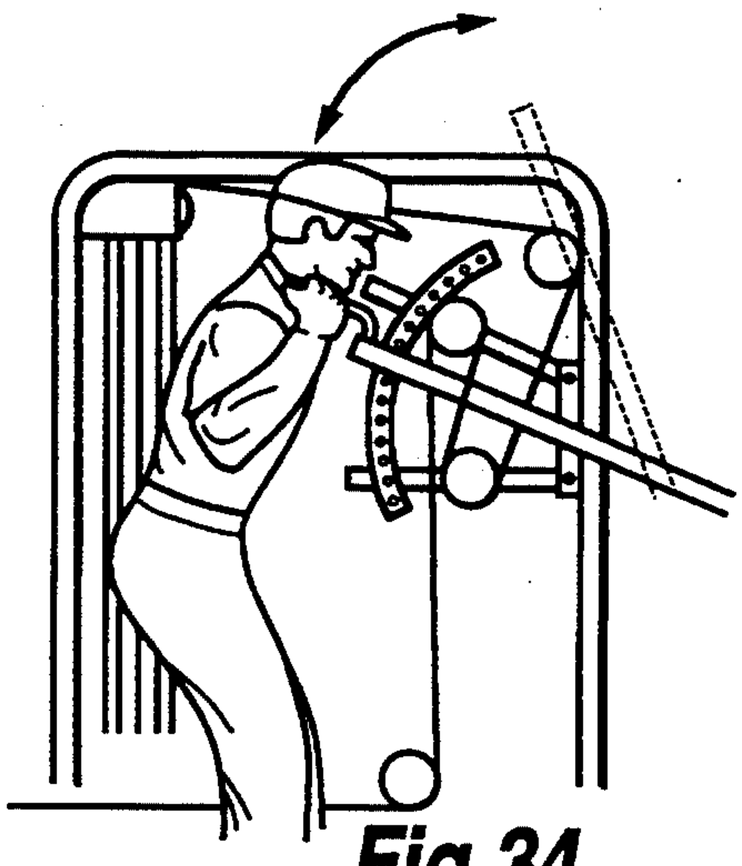

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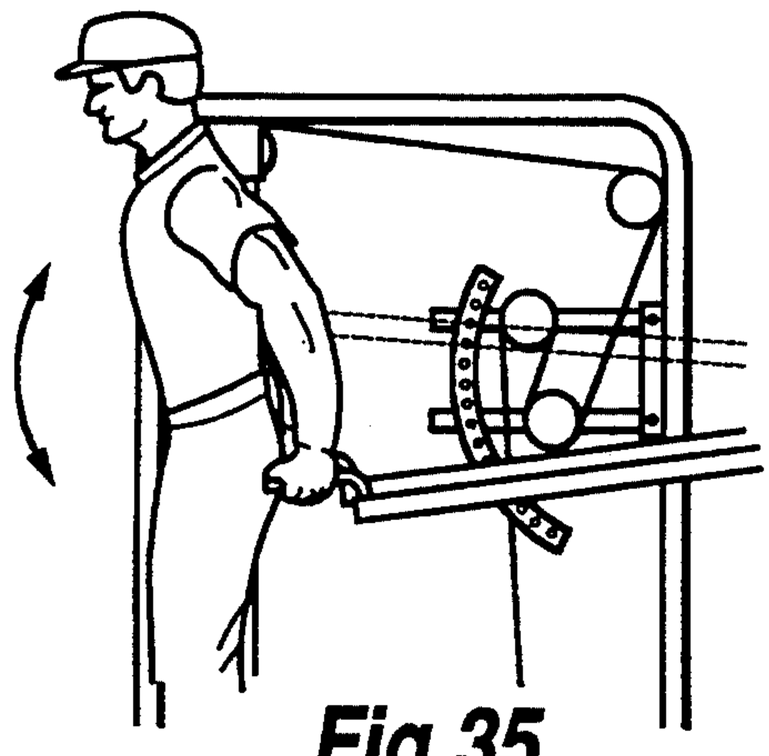

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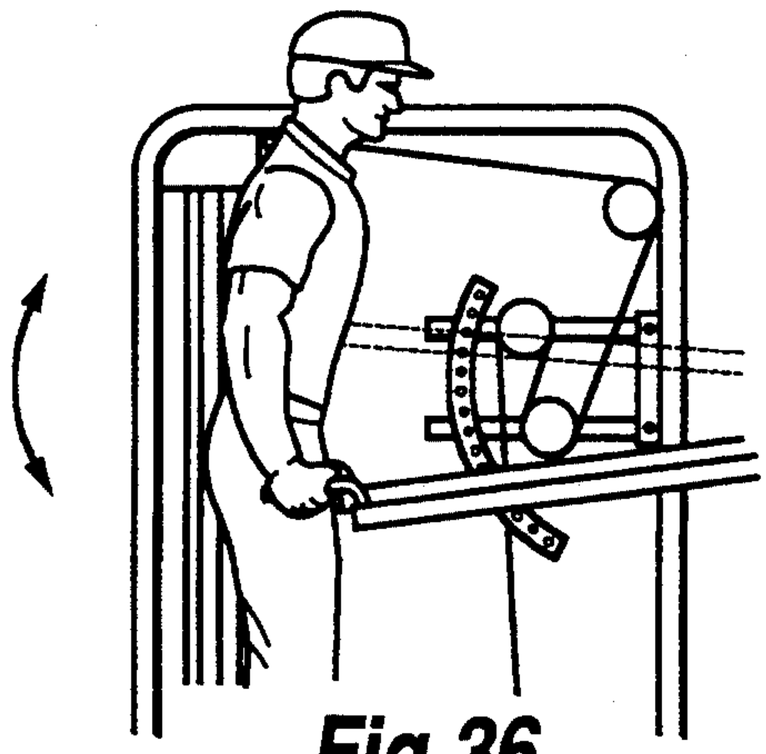

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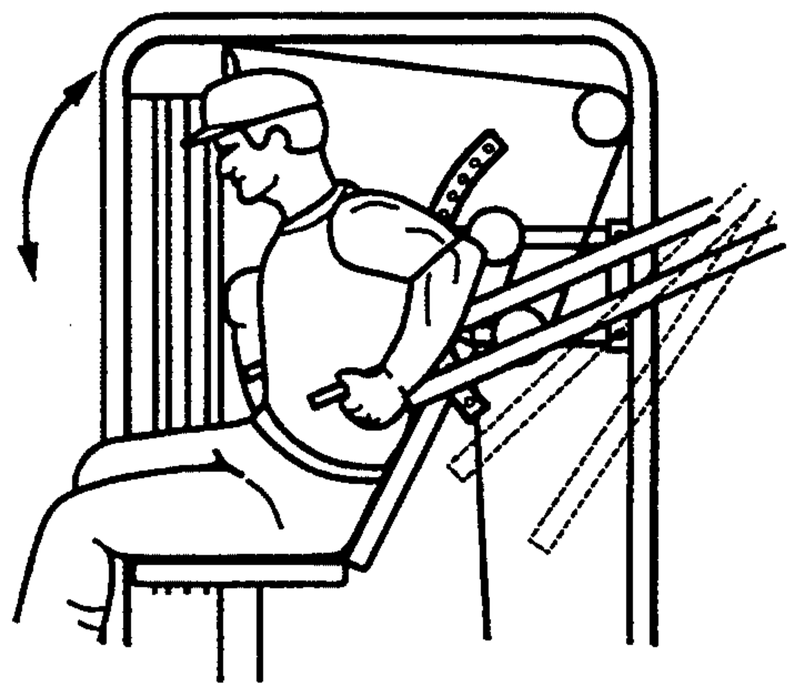

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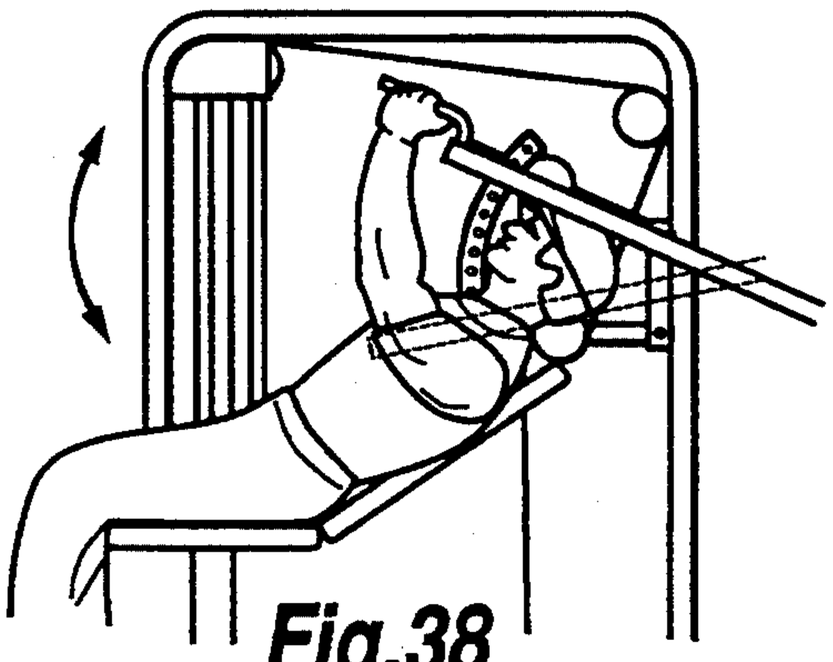

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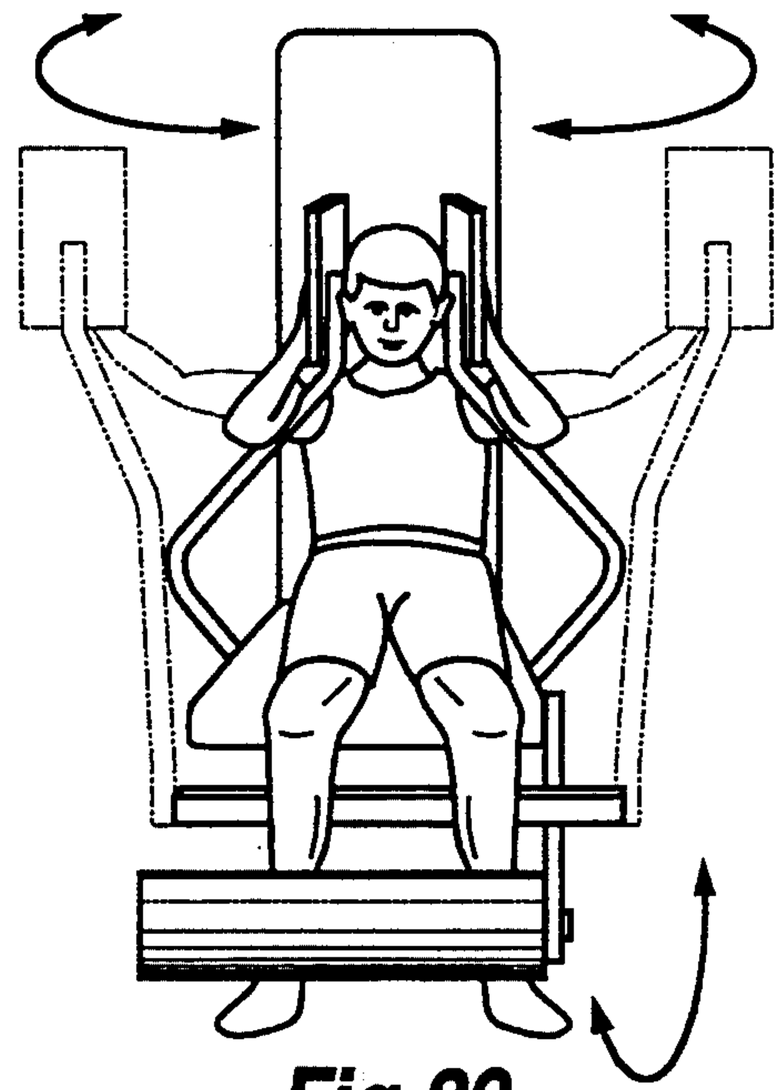

Fig.39

Fig.40

Fig.41

WEIGHT LIFTING MACHINE

TECHNICAL FIELD

This invention relates generally to weight lifting machines, and more particularly to a weight lifting machine configured to allow a wide variety of exercises using a single weight stack, and a single lift cable with consistent resistance applied thereto.

BACKGROUND OF THE INVENTION

With the advent of the physical fitness boom, weight lifting machines of all shapes and sizes appeared on the market. Unfortunately, each machine typically provides for a very limited range of exercises, requiring several machines to accomplish a full workout.

Various means of resistance have been employed in the many different types of weight lifting machines. Hydraulic and pneumatic resistance, as well as cable supported lead weight resistance have been employed, with the traditional lead weight resistance machines exhibiting greater durability. Due to the fact that the weight stack is suspended from a cable for incrementally adjusting the amount of weight being lifted, the range of exercises available has been limited by the configuration of the lift cable. Typically, the cable is configured for extension and retraction in a single direction over a series of pulleys. Therefore, movement of the weight lifting bar or lever connected to the opposed end of the lift cable is restricted to a particular range or direction of movement, thereby requiring several different machines to complete a full body workout.

SUMMARY OF THE INVENTION

The weight lifting machine of the present invention overcomes the foregoing limitations and restrictions by providing a lift cable attached to the weight stack and configured through a series of pulleys for directional movement of the cable while maintaining consistent tension for lifting the weight stack through a variety of ranges and from a variety of directions to allow for a more complete workout using the single weight stack.

A lift bar is pivotally mounted to the frame and adjustably connected to a curved member for upward or downward positioning of the lift bar. The curved member is attached to a pivot arm mounted for pivotal movement between parallel upper and lower restraining arms having pulleys mounted thereon for guiding the movement of the cable and maintaining constant resistance. The restraining arms allow movement in the direction of one arm at a time, yet are anchored to limit pivotal movement toward the other arm, resulting in constant tension on the lift cable, to provide a more controlled workout.

In one embodiment of the weight lifting machine, a second series of pulleys allows the single lift cable to be attached to a second weight lifting station for lifting the weights from the single weight stack through a leg extension bar and two separately pivoting butterfly bars.

A moveable bench is mounted for positioning on a track under the weight lifting bar. The bench may be moved horizontally along the track such that the area immediately below the weight lifting bar is clear to allow the weight lifter to perform standing exercises such as squats, shrugs, and calf extensions. The back of the bench is angularly positionable in relation to the seat to provide a variety of reclining angles in relation to the lift bar. The bench may also be pivoted about a vertically extending axis to allow lifting of the bar in a generally rearward position, or the bench may be rotated 180° to allow the bar to be lifted in a generally forward position in relation to the person exercising.

The expanded range of motion provided by the curved member for adjusting the angle of the lift bar, the cable configuration for the first and second stations, as well as the multi-position bench allow an exerciser to complete a full body workout in a limited space using a single machine having a single weight stack, and a single lift cable against which consistent tension is maintained.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and the advantages thereof, reference is now made to the following Detailed Description taken in conjunction with the accompanying Drawings, in which:

FIG. **1** is a perspective view of a single station weight lifting machine incorporating a first embodiment of the present invention;

FIG. **2** is a schematic diagram of the pulley and lift cable configuration of the weight lifting machine of FIG. **1**;

FIG. **3** is a side view of a lift bar adjustment and the lift cable resistance of the weight lifting machine of FIG. **1**;

FIG. **4** is a side view similar to FIG. **3**, illustrating upward movement of the lift bar;

FIG. **5** is a side view similar to FIG. **3**, illustrating downward movement of the lift bar;

FIG. **6** is a side view of a portion of the lift bar and the cable resistance of the weight lifting machine of FIG. **1**;

FIG. **7** is a side view of a cable resistance configuration incorporating a second embodiment of the cable resistance of the weight lifting machine of the present invention;

FIG. **8** is a side view of a cable resistance configuration incorporating a third embodiment of the cable resistance of the weight lifting machine of the present invention;

FIG. **9** is a side view of a cable resistance incorporating a fourth embodiment of the cable resistance of the weight lifting machine of the present invention;

FIG. **10** is a schematic diagram of the cable path of a weight lifting machine incorporating a second embodiment cable path of the weight lifting machine of the present invention;

FIG. **11** is a schematic diagram of the cable path and cable resistance of a weight lifting machine incorporating a third embodiment cable path and a fifth embodiment cable resistance of the weight lifting machine of the present invention;

FIG. **12** is a view similar to FIG. **11** illustrating downward movement of the lift bar;

FIG. **13** is a view similar to FIG. **11**, illustrating upward movement of the lift bar;

FIG. **14** is a side view of the bench of the weight lifting machine of FIG. **1**, illustrating adjustable angular positioning of the bench back;

FIG. **15** is a side view of the bench of FIG. **1**, illustrating vertical adjustment of the bench;

FIG. **16** is a top view of the bench of FIG. **1**, illustrating rotational adjustment of the bench;

FIG. 17 is a partial oblique view of the base of the bench of FIG. 14, showing the locking mechanism for securing the horizontal position of the bench;

FIG. 18 is a partial front view of the base of FIG. 17 wherein the vertical adjustment and horizontal locking apparatus are shown in greater detail;

FIG. 19 is a view similar to FIG. 18 illustrating a second embodiment of the horizonal locking apparatus;

FIG. 20 is a side view of a portion of the weight lifting machine of FIG. 1 showing a second adjustable weight lifting apparatus attached to the frame of the weight lifting machine;

FIG. 21 is an enlarged view of the adjustment mechanism of the weight lifting apparatus of FIG. 20;

FIG. 22 is a side view of the adjustment mechanism of FIG. 21;

FIG. 23 is a schematic diagram showing the rotational movement of the weight lifting device of FIG. 20;

FIG. 24 is an enlarged view of a portion of the second weight lifting device of FIG. 20 showing lift cable attachment to the weight lifting device;

FIG. 25 is a multi-station weight lifting machine incorporating a second embodiment of the weight lifting machine of the present invention;

FIG. 26 is a schematic diagram of the lift cable configuration of the weight lifting machine of FIG. 25;

FIG. 27 is a partial top view of one station of the weight lifting machine of FIG. 25;

FIG. 28 is a view similar to FIG. 27 illustrating pivotal movement of butterfly bars of the weight lifting machine of FIG. 25;

FIG. 29 is a view similar to FIG. 28 illustrating further movement of the butterfly bars;

FIG. 30 is an illustration of the exercise known as shoulder or military press or pull down, using the weight lifting machine of FIGS. 1 and 25;

FIG. 31 is an illustration of the exercise known as incline press, using the weight lifting machine of FIGS. 1 and 25;

FIG. 32 is an illustration of the exercise known as bench press, using the weight lifting machine of FIGS. 1 and 25;

FIG. 33 is an illustration of the exercise known as shoulder press or pull down, using the weight lifting machine of FIGS. 1 and 25;

FIG. 34 is an illustration of the exercise known as squat, using the weight lifting machine of FIGS. 1 and 25;

FIG. 35 is an illustration of the exercise known as tricep extension or rowing, using the weight lifting machine of FIGS. 1 and 25;

FIG. 36 is an Illustration of the exercise known as tricep extension or rowing using the weight lifting machine of FIGS. 1 and 25;

FIG. 37 is an illustration of the exercise known as seated tricep extension or rowing, using the weight lifting machine of FIGS. 1 and 25;

FIG. 38 is an illustration of the exercise known as incline bench press and incline lat pull, using the weight lifting machine of FIGS. 1 and 25;

FIG. 39 is an illustration of the exercises known as butterflies and leg extensions, using the weight lifting machine of FIG. 25;

FIG. 40 is an illustration of the exercise known as back extension, using the weight lifting machine of FIG. 20; and

FIG. 41 is an illustration of the exercise known as stomach crunch, using the weight lifting machine of FIG. 20.

DETAILED DESCRIPTION

Referring now to the Drawings and more particularly to FIGS. 1 and 2 thereof, there is shown a weight-lifting machine 10 incorporating a first embodiment of the present invention. A main support frame 12 has a base frame 14 connected to a vertically extending weight support frame 16. A bench 18 is mounted for horizontal movement along a track 20 connected to the base frame 14. Pivotally mounted to the weight support frame 16 is a lift apparatus 22, mounted for rotation about an axis 24 extending in a generally horizontal orientation and perpendicular to the weight support frame 16.

The lift apparatus 22 has a first end 26 extending over the bench track 20 and a second end 28 extending beyond the pivotal attachment point 30 to the weight support frame 16. Lift handles 32 are mounted in the first end 26 of the lift apparatus 22 for gripping by an exerciser to pivot the lift apparatus 22 about the axis 24. Openings 34 in the first end 26 of the lift apparatus 22 allow the insertion of alternative forms of lift bars and handles for performing exercises such as squats. A weight stack 36 is mounted on the weight support frame 16 and is preferably a conventional plate type stack, having a selector rod 38 extending vertically through a stack of individual plates 40 of varying weight and a carriage 42 for vertical movement of a selected number of the plates 40.

A lift cable 44 is connected to the selector rod 38 and passes over a lift pulley 46 mounted to the weight support frame 16 for rotational movement at a point above the weight stack 36 such that the cable 44 moves in a generally vertical path from the weight stack 36 over the lift pulley 46. The lift cable 44 then passes over a pair of resistance pulleys 48 and 50 mounted for rotation on pivotal arms 52 and 54, respectively. The lift cable 44 then passes around anchor pulley 56 and is fixedly attached to the weight support frame 16 at a point beyond the anchor pulley 56.

Mounted at pivotal attachment point 30 for pivotal movement between pivotal arms 52 and 54 is a support arm 58, having an apertured arc member 60 mounted thereon. Referring now to FIGS. 1, 2, 3, and 6, the apertured arc member 60 has a first side 62 which faces the pivotal support arm 58 and a second side 64 facing the lift apparatus 22. The arc member 60 is fixedly mounted at an approximate center point 66 to the support arm 58. Mounted for rotation on the first side 62 of the arc member 60, such that the pivotal support arm 58 extends therebetween, are two wheel members 68 and 70. A restraining cable 72 is connected to the weight support frame 16 at a point 74, above the pivotal arm 54 and is attached to pivotal arm 54 at a point 76 near the distal end of the pivotal arm 54 to restrain downward pivotal movement of pivotal arm 54. A similar restraining cable 78 is attached pivotal arm 52 at attachment point 80 and extends downwardly therefrom for attachment to the weight support frame 16 at attachment point 82, to restrict upward pivotal movement of pivotal arm 52.

Referring now to FIGS. 1, 4, 5, and 6, the lift apparatus 22 is adjustably connected to the arc member 60 by a pin 84 inserted through an opening 86 in the lift apparatus 22 and into any one of the apertures 88 of the arc

member **60**. Thus, once a desired lift angle is selected and set by inserting the pin **84** through the opening **86** in the lift apparatus **22** and into an aperture **88** in the arc member **60**, movement of the lift apparatus **22** in an upward direction causes the wheel member **68** to rotatively contact pivotal arm **54** forcing pivotal arm **54** and resistance pulley **50** in an upward direction. Restraining cable **78** prevents upward movement of pivotal arm **52** and pulley **48**, thereby altering the path of the lift cable **44** by increasing the relative distance between pulleys **50** and **48**, as illustrated in FIG. **4**, to move a length of the cable over lift pulley **46**, thereby lifting the pre-selected number of plates **40** vertically from the weight stack **36**.

Similarly, when the lift apparatus **22** is moved in a generally downward direction, the wheel member **70** rotatively contacts and forces pivotal arm **52** and resistance pulley **48** in a downward position, as illustrated in FIG. **5**. Restraining cable **72** prevents downward movement of pivotal arm **54** to increase the relative distance between resistance pulleys **48** and **50**, thereby altering the path of the lift cable **44** and moving a length thereof over lift pulley **46** to lift a pre-selected number of the plates **40** from weight stack **36**. Thus, the combined configuration of the pivotal arms **52** and **54** and associated resistance pulleys **48** and **50** operating in conjunction with restraining cables **72** and **78** allow for smooth, bi-directional movement of the lift arm while maintaining a constant resistance on lift cable **44**.

As shown in FIGS. **3**, **4** and **5**, pivotal arms **52** and **54** have apertures **90** at spaced apart intervals therein. Pins **92** pass through central passages **94** in restraining pulleys **48** and **50** for insertion into the apertures **90** to thereby adjust the position of resistance pulleys **50** and **48** to lower or increase the resistance applied to lift cable **44** by altering the position of pulleys **50** and **48** along pivotal arms **54** and **52**, respectively.

Referring now to FIG. **7**, there is shown a pivotal arm configuration incorporating a second pivotal arm configuration embodiment of the weight lifting machine of the present invention. Many of the elements are similar to those of the pivotal arm configuration of the weight lifting machine **10** of FIGS. **1** and **3** and will be given the same reference numerals with the second embodiment pivotal arm configuration being differentiated by a prime "'" designation. The pivotal arm **52'** and **54'** have tabs **100** and **102**, respectively, mounted to the distal ends thereof and extending toward the pivotal support arm **58'**. Wheel members **104** and **106** are rotatably mounted on the tabs **100** and **102**, respectively, for rotational movement along the surface of support arm **58** as support arm **58** is moved into upward contact with wheel member **104** and into downward contact with wheel member **106**.

Referring now to FIG. **8**, there is shown a pivotal arm configuration incorporating a third of the pivotal arm of the weight lifting machine of the present invention. Many of the elements are similar to those of the pivotal arm configuration of the weight lifting machine **10** of FIGS. **1** and **3** and will be given the same reference numerals with the third embodiment pivotal arm configuration being differentiated by a prime "'" designation. Pivotal support arm **58'** has a wheel member **108** rotatably mounted thereon and having a diameter substantially equal to the distance separating pivotal arm **54'** from pivotal arm **52'**. Therefore, as pivotal support arm **58'** is moved in a generally upward direction, wheel member **108** contacts pivotal arm **54'** and rotates along the side of pivotal arm **54'** as pivotal arm **54'** is forced in a generally upward direction. Likewise, as pivotal support arm **58'** is moved in a generally downward direction, wheel number **108** contacts pivotal arm **52'** and rotates along pivotal arm **52'** as pivotal arm **52'** is forced in a generally downward direction. As with the weight lifting machine **10**, the restraining cable **72'** limits downward pivotal movement of pivotal arm **54'**, and restraining cable **78'** limits upward pivotal movement of pivotal arm **52'**, thereby increasing the distance between pulleys **50'** and **48'** as pivotal support arm **58'** is moved in an upwardly or downwardly direction.

Referring now to FIG. **9**, there is shown a pivotal arm configuration incorporating a fourth embodiment of the pivotal arm configuration of the weight lifting machine of the present invention. Many of the elements are similar to those of the pivotal arm configuration of the weight lifting machine **10** of FIGS. **1** and **3** and will be given the same reference numerals with the fourth embodiment pivotal arm configuration being differentiated by a prime "'" designation. A bar **110** is attached to the weight support frame **16'** at a point **112** above the pivotal arm **54'** and extends downwardly therefrom terminating at a point below the uppermost edge of pivotal arm **52'**. Extending perpendicularly from the bar **110** is a stop peg **114** which contacts the lowermost surface of pivotal arm **54'** to restrict downward movement of pivotal arm **54'**. A second stop peg **116** extends outwardly from the bar **110** for contacting the uppermost surface of pivotal arm **52'**, to restrict upward movement of pivotal arm **52'**. Thus, bar **110** and stop pegs **114** and **116** of FIG. **9** perform the same function of limiting pivotal movement as that performed by restraining cables **72** and **78** of FIG. **1**.

Referring now to FIG. **10**, there is shown a schematic diagram of a pulley configuration **117** incorporating a second embodiment pulley configuration of the weight lifting machine of the present invention. Many of the elements are similar to those of the weight lifting machine **10** of FIG. **2** and will be given the same reference numerals with the second embodiment pulley configuration being differentiated by a prime ' designation. The lift cable **44'** is attached at a first end to a selector rod **38'** of the weight stack **36'**. The lift cable **44'** extends vertically from the weight stack **36'** and passes over a first lift pulley **46'**, from where the path of the lift cable **44'** extends in a generally horizontal direction to pass over a second lift pulley **118** thereby distributing the lift stress prior to passing the lift cable **44'** around a first resistance pulley **48'** and over a second resistance pulley **50'**. After passing over resistance pulley **50'**, the lift cable **44'** extends in a generally vertical direction and passes under an anchor pulley **56'** and is attached to the weight support frame **16'** at some point beyond anchor pulley **56'**.

The resistance pulleys **48'** and **50'** are mounted on pivotal arms **52'** and **54'**, respectively, such that movement of apertured arc member **60'** moves pivotal support arm **58'**, on which it is mounted, into contact with pivotal arm **54'** in the upward direction and into contact with pivotal arm **52'** in the downward direction to increase the distance between resistance pulleys **50'** and **48'**, altering the path of the lift cable **44'**, and thereby raising a preselected amount of weight.

Referring now to FIGS. **11**, **12**, and **13**, there is shown a schematic illustration of a pulley and cable configuration incorporating a third embodiment pulley configuration of the weight lifting machine of the pres-

ent invention. Many of the elements are similar to those of the weight lifting machine **10** of FIG. **2** and will be given the same reference numerals with the third embodiment pulley configuration being differentiated by a prime "′" designation. The lift cable **44′** is connected at one end to the selector rod **38′** of the weight stack **36′** and travels in a generally vertical direction to pass over lift pulley **46′**. After passing over the lift pulley **46′**, the cable passes between resistance pulleys **122** and **124**.

Resistance pulley **122** is rotatably mounted on the distal end **126** of a support arm **128** fixedly attached to the top of the weight support frame **16′** and extending downwardly therefrom in a generally vertical direction. Resistance pulley **124** is likewise rotatably mounted on the distal end **130** of a support arm **132** fixedly attached to the bottom of the weight support frame **16′** and extends upwardly therefrom in a generally vertical direction such that resistance pulley **124** is in vertical alignment with and adjacent to resistance pulley **122** near the distal end of the support arm **58′** and between the distal end of the pivotal support arm **58′** and the lift pulley **46′**. The second end of the lift cable **44′** is pivotally attached to the distal end of the pivotal support arm **58′**. Thus, as the lift apparatus **22′** is pulled downwardly, pivotal support arm **58′** is forced downwardly such that lift cable **44′** passes under resistance pulley **122** and over resistance pulley **124** to lift the preselected amount of weight. Likewise, when lift apparatus **22′** is moved in an upward direction, forcing pivotal support arm **58′** in a generally upward direction, lift cable **44′** passes under and around resistance pulley **122**, thereby lifting the preselected amount of weight.

Referring now to FIG. **14**, the bench **18** of the weight lifting machine **10** has a seat **140** and a back **142**. The seat **140** has a cushion **144** and a base **146** on which the cushion **144** is mounted. Likewise, the back **142** has a cushion **148** mounted on a base **150**. A portion of the seat base **146** extends rearwardly beyond the seat **140**. The portion of the base **146** extending beyond the cushion **144** forms an adjustment member **152** having an aperture **154** therein. Mounted to the base **150** of the back **142** is a corresponding adjustment member **156** which extends outwardly from the base **150** of the back **142** adjacent to the adjustment member **152**. A series of apertures **158** are arranged in an arcuate pattern along adjustment member **156** for positioning of any one of the apertures adjacent the aperture **154** in adjustment member **152** for receiving a pin **160** therethrough, thereby adjusting the position of the back **142** in angular relationship to the seat **140**. Thus, the seat back **142** may be adjusted to any of a number of angles from substantially vertical to substantially horizontal, as illustrated in FIG. **14**. Although, in the preferred embodiment of the invention the bench back is adjusted through use of the adjustment member **152**, it is understood that a gear type adjustment **153**, as illustrated in FIG. **1**, may be substituted therefor.

In addition to the angular adjustment of the bench back **142**, the entire bench **18** may be adjusted vertically, as shown in FIG. **15**, to obtain the height necessary to accommodate exercisers of all body types and sizes and for performing a variety of different exercises depending upon the angular adjustment of the lift apparatus of the weight lifting machine. The bench **18** is supported on a shaft **162** inserted within a cylinder **164** for vertical movement therein and is supported on a spring **166** within cylinder **164**, as shown in FIG. **18**. The shaft **162** has a plurality of apertures **168** extending in vertical alignment therein. Cylinder **164** has a corresponding aperture **167** therein for receiving a pin **170** which is inserted into one of the corresponding apertures **168** of shaft **162** to lock the vertical position of the bench **18**. When the pin **170** is removed from the apertures **167** and **168**, the spring **166** forces the shaft **162** upwardly, thereby raising the bench **18**. Pressure is applied to the seat **140** of the bench **18**, thereby compressing the spring **166** and lowering the bench **18**. When the desired vertical position is achieved, the pin **170** is inserted into the aperture **167** in the cylinder **164** and the corresponding aperture **168** in the shaft.

Referring now to FIG. **16**, in addition to the apertures **168** in the shaft **162**, there exist additional vertically extending rows of apertures **172** at spaced apart intervals around the circumference of the shaft **162**. Thus, in addition to allowing the vertical movement of the bench **18**, removal of the pin **170** allows vertical rotation of the shaft **162** within the cylinder **164**, thereby allowing vertical rotation of the bench **18**, as illustrated in FIG. **16**.

Referring now to FIGS. **17** and **18**, the cylinder **164** of the bench **18** is mounted on a platform **173** having wheel members **174** mounted on opposed ends thereof for horizontal movement of the platform **173** over the bench track **20**. A lever **176** is pivotally mounted in a bracket **178** fixedly attached to the platform **173**. Mounted on the end of the lever **176** near the pivotal attachment point **180** of the lever **176** to the bracket **178** is the first half **182** of an interlocking rack bar. The second half **184** of the interlocking rack bar is mounted under a lip **186** of the bench track **20** and extends the length thereof. The first half **182** and second half **184** of the interlocking rack bar have corresponding surfaces of alternating peaks and valleys matingly connecting the first half **182** and second half **184** of the interlocking rack bar when the lever **176** is pivoted in a generally downward position, thereby bringing the first half **182** of the interlocking rack bar upwardly and in contact with the second half **184** of the interlocking rack bar. Thus, the corresponding peaks and valleys of the surfaces of the rack bar prevent horizontal movement of the platform **173** over the bench track **20**. Similarly, movement of the lever **176** in a generally upward direction about pivot point pivotal attachment point **180** moves the first half **182** of the rack bar in a generally downward position, thereby disengaging the second half **184** of the rack bar to allow freedom of movement of the platform **173** over the track **20**.

Referring now to FIG. **19**, there is shown a second embodiment bench **190** of the weight lifting machine of the present invention. Many of the elements are similar to those of the weight lifting machine **10** of FIG. **18** and will be given the same reference numerals with the second embodiment bench being differentiated by a prime "′" designation. A flange **192** is mounted on the end of the lever **176′** adjacent the pivotal attachment point **180′** and extends under the lip **186′** of the track **20′**. A rod **194** is mounted on the flange **192** and extends in a generally upward direction. A series of apertures **196** extend the length of the lip **186′** for receiving the rod **194** therein upon pivoting of the lever **176′** in a generally downward position, thereby locking the platform **173′** in position to prevent horizontal movement over the track **20′**. Pivoting of the lever **176′** in a generally upward direction moves the flange **192** in a generally downward direction thereby removing the rod **194**

from the aperture **196** in the lip **186'**, freeing the platform **172'** for horizontal movement along the track **20'**.

Referring now to FIG. **20**, there is shown a second lift apparatus **200** having a U-shaped frame **202** for mounting the lift apparatus **200** on the weight support frame **16** of the weight lifting machine **10**. A wheel member **204** is fixedly mounted on a shaft **206** extending through the U-shaped frame **202** such that the wheel member **204** rotates clockwise and counter-clockwise within the U-shaped frame **202**.

As illustrated in FIGS. **20** and **24**, the lift cable **44** passes around the anchor pulley **56** and under a first guide pulley **208** mounted on the weight support frame **16** near the base frame **14**. The lift cable **44** then passes through an opening **210** in the weight support frame **16** and around a second guide pulley **212** rotatably mounted on a support member **214** attached to the weight support frame **16** and extending substantially parallel to the U-shaped frame **202**. After passing around the second guide pulley **212**, the end of the lift cable **44** extends vertically upwardly from the pulley **212** and is pivotally connected to the wheel member **204** at pivot point **224**.

Referring still to FIG. **24**, a bracket **216** is mounted to the U-shaped support frame **202** adjacent the shaft **206** and extends downwardly therefrom and perpendicular to the U-shaped support frame **202**. Rotatably mounted in the distal end of the bracket **216** are guide pulleys **218** and **220**. Thus, as the wheel member **204** is rotated in a clockwise direction, lift cable **44** drawn over guide pulley **220**, and as wheel member **204** is rotated in a counter-clockwise direction, lift cable **44** is drawn over guide pulley **218**.

Referring now to FIGS. **20**, **21** and **22**, fixedly mounted to the shaft **206** is a gear **222** interposed between the U-shaped frame **202** and an adjustment frame **224**. Mounted within the adjustment frame **224** is a tooth cleat **226** for engagement with the gear **222**. Interposed between the cleat **226** and a block **228** is a spring **230** surrounding a lever **232** slidably extending through the block **228** and attached to the base of the cleat **226**. When downward pressure is applied to the lever **232**, the cleat **226** is forced downwardly, compressing the spring **230** and disengaging the gear **222**. Once the cleat **226** and gear **222** are disengaged, the adjustable frame **224** can be rotated about the shaft **206** for angular positioning of the adjustable frame **224** in relation to the U-shaped frame **202**. Once the desired angular position has been achieved, the downward pressure on the lever **232** is released allowing the spring **230** to expand forcing the cleat **226** into engagement with the gear **222** to lock the adjustable frame **224** in position.

Referring still to FIG. **20**, the adjustable frame **224** has apertures **234** therein for receiving a variety of weight lifting members therein, such as a bar **236**, a padded roll **238**, or a crooked bar **240**. As the weight lifter applies force to the weight lifting member, in this instance the crooked bar **240**, the adjustable frame **224** is rotated clockwise or counter-clockwise depending upon the direction of the force applied by the exerciser, as illustrated in FIG. **23**. As the adjustable frame **224** rotates, the shaft **206** is rotated, in turn rotating the wheel member **204**, thereby winding the lift cable **44** around the wheel member **204**.

Referring now to FIGS. **20** and **23**, as the lift cable **44** is wound about the wheel member **204**, it is drawn near the guide pulleys **212** and **208**, around the anchor pulley **56**, over the resistance pulley **50**, around the resistance pulley **48**, and over the lift pulley **46**, thereby raising the preselected number of plates **40** of the weight stack **36**. Thus, with the addition of guide pulleys **208** and **212** and the attachment of the cable to wheel member **204**, a single cable is used to lift plates **40** of the weight stack **36** through actuation of the first lift apparatus **22** as well as the second lift apparatus **200**. The lift members **236**, **238**, and **240** may also be inserted into the opening **34** in the lift apparatus **22** to provide a variety of lifting surfaces for lift apparatus **22**.

Referring now to FIGS. **25**, **26**, and **27**, there is shown a dual station weight lifting machine **250** incorporating a second embodiment weight lifting machine of the present invention. Many of the elements are similar to those of the weight lifting machine **10** of FIG. **1** and will be given the same reference numerals with the second embodiment weight lifting machine being differentiated by a prime "'" designation. The weight lifting machine **250** has a second base frame **252** having a bench **254** mounted thereon. The bench **254** has a seat **256** and a back **258**, which faces away from the weight support frame **16'** and in a direction generally perpendicular to that of the bench **18'**.

Pivotally mounted to the base frame **252** on one side of the bench **254** is a butterfly bar **260** which extends upwardly from the base frame **252** to a level approximately chest high of a person seated on the bench **254**. A second butterfly bar **262** is pivotally mounted on the base frame **252** on the side of the bench **254** opposite the first butterfly bar **260**. The butterfly bars **260** and **262** have bases **264** and **266**, respectively, which are pivotally mounted on the base frame **252** and extend in a generally horizontal direction. Mounted on one end of bases **264** and **266** are curved bar members **268** and **270**, respectively, which extend in a generally vertical direction upwardly from the bases **264** and **266**. Extending upwardly from the crooked bar members **268** and **270** are padded extensions **272** and **274**, respectively, and, when in a resting position, extending in a generally vertical direction and substantially parallel to the weight support frame **16'**.

A stop **276** limits pivotal movement of base **264** of butterfly bar **260** about pivotal attachment point **278** in a direction toward the weight support frame **16'**. A similar stop **280** limits pivotal movement of base **266** of butterfly arm **262** about pivotal attachment point **282** in a direction toward the weight support frame **16'**. Thus, padded extensions **272** and **274** may be pushed forwardly and inwardly to the point of contacting one another but are limited in their return movement rearwardly by stops **276** and **280**, respectively.

Base frame **252** has opposed side members **284** and **286** attached to the weight support frame **16'** at spaced apart locations and extending perpendicularly outwardly therefrom. A transverse member **288** extends perpendicular to and is attached on opposed ends to side members **284** and **286** to form a generally U-shape extending outwardly from the weight support frame **16'**. The bench **254** is supported on the transverse member **288** by shaft **290**.

A rod **292** extends parallel to and between the side members **284** and **286** and is connected at one end to the weight support frame **16'** and at the other end to transverse member **288** of the base frame **252**. A carriage **294** is mounted surrounding the rod **292** for slidable movement along rod **292** between the weight support frame **16'** and the transverse member **288** of the base frame **252**. A stop **296** extends a short distance outwardly from

the weight support frame **16'** to restrict the movement of the carriage **294** over the rod **292** as it approaches the weight support frame **16'**. Rotatably mounted to the underside of the carriage **294** and adjacent to one another are a resistance pulley **298** and a guide pulley **300**.

A second resistance pulley **302** is rotatably mounted on top of side member **284** of base frame **252** at a point near the weight support frame **16'**. Similarly mounted on top of side member **286** of base frame **252** is a third resistance pulley **304**. Two small guide pulleys **306** and **308** are mounted on the top of transverse member **288** of the base frame **252** on opposed sides of shaft **290** supporting the bench **254**. A cable **310** is connected at one end to the distal end **312** of base **264** of the butterfly bar **260** and is threaded around small pulley **306** from where it extends toward weight support frame **16'** to pass around guide pulley **300**. Cable **310** then travels away from weight support frame **16'** to pass around small pulley **308** from where the second end extends for attachment to the distal end **314** of base **266** of butterfly bar **262**.

An arcuate member **316** is mounted on the side **318** of base **264** facing outwardly from the weight support frame **16'**, near the distal end **312** of the base **264**. A similar arcuate member **320** is mounted on the side **322** of base **266** facing outwardly from the weight support frame **16'**. Thus, as the butterfly bars **260** and **262** are rotated forward, either together or singularly, the ends of the cable **310** are drawn around arcuate members **316** and **320** away from small pulleys **306** and **308**, thereby drawing guide pulley **300** toward small pulleys **306** and **308**, in turn moving carriage **294** along rod **292** toward transverse member **288** of the base frame **252**, as illustrated in FIGS. **28** and **29**.

Referring now to FIGS. **25**, **26**, and **27**, the side member **286** of the base frame **252**, extends beyond the transverse member **288** and has a guide pulley **324** mounted for rotation on the distal end **326** thereof. Mounted to the base **328** of the seat **256** of the bench **254** is a pivotal support frame **330**. Pivotally attached to the support frame **330** is a pivotal extension arm **332** having a lift member **334** rotatably mounted thereon and extending substantially perpendicular to the pivotal extensions arm **332** and parallel to the transverse member **288**. An arcuate member **336** is attached to the pivotal extension arm **332** such that the outer curve of the arc faces toward the weight support frame **16'**.

As in the weight lifting machine **10** of FIG. **1**, the first end of the lift cable **44'** is attached to the selector rod **38'** of the weight stack **36'**. The cable path for the weight lifting machine **250** is the same as that for weight lifting machine **10** of FIG. **1** to the point of the anchor pulley **56'**. From that point, as clearly shown in FIGS. **25**, **26**, and **27**, the lift cable **44'** passes around the side of resistance pulley **302** nearest the weight support frame **16'**, and from there is threaded around the side of resistance pulley **298** away from the weight support frame **16'**. Lift cable **44'** then passes around the side of resistance pulley **304** nearest weight support frame **16'** and extends horizontally away from resistance pulley **304** and the weight support frame **16'** to pass under guide pulley **324** and upwardly to the pivotal extension arm **332** for attachment thereto at a point near the attachment point of lift member **334** to pivotal extension arm **332**. As lift member **334** is lifted upwardly and outwardly from the starting position as shown in FIG. **25**, the lift cable **44'** is drawn around arcuate member **336** thereby lifting a selected number of plates **40'** of the weight stack **36'**.

Referring now to FIGS. **25**, **26**, **28**, and **29**, attachment of the lift cable **44'** to the pivotal extension arm **332** provides a fixed attachment point for the second end of the lift cable **44'** when using the butterfly bars **260** and **262**. Thus, as the butterfly bars **260** and **262** are pivoted forward to draw carriage **294** toward transverse member **288** of base frame **252**, resistance pulley **298** is likewise drawn toward transverse member **288**, thereby drawing lift cable **44'** over and around resistance pulley **302**, anchor pulley **56'**, resistance pulleys **48'** and **50'**, and lift pulley **46'** to lift a preselected number of the plates **40'** of the weight stack **36'**.

The restraining cables **72'** and **78'** prevent pivotal movement of the pivotal arms **52'** and **54'** such that constant resistance is maintained on lift cable **44'** as the butterfly bars **260** and **262** are pivoted forwardly and inwardly. Thus, the pulley and cable configuration of the weight lifting machine **250** of FIG. **25** allows the lifting of weight through the use of a single lift cable **44'** by actuation of the first lift apparatus **22'**, the butterfly bars **260** and **262**, and lift member **334**. The use of a single cable to lift the weights by actuation from any one of the exercise stations facilitates easy maintenance and repair of the weight lifting machine.

Referring now to FIGS. **30** through **41**, there is illustrated a variety of exercises which can be performed using the weight lifting machines **10** and **250** and the second lift apparatus **200** of weight lifting machine **10**. As illustrated in FIG. **30**, the exerciser may rotate the bench **18** to face the lift apparatus **22** to performing an upwardly lifting exercise generally known as military press or pull down. As shown in FIG. **1**, the exerciser may rotate the bench **18** and adjust the incline of the back **142** of the bench **18** to perform an exercise generally known as incline bench press. An alternative version of the bench press may be performed by adjusting the back **142** of the bench **18** to a full horizontal position with the bench rotated to face the lift apparatus **22**.

As shown in FIG. **33**, the bench may be positioned at an incline similar to that shown in FIG. **30**, but rotated 180° which puts the exerciser facing away from the lift apparatus **22** to perform an exercise generally known as a military press.

Squats may be performed using the weight lifting machines **10** and **250** of the present invention by moving the bench **18** along the track **20** to a position away from the lift apparatus **22**. The exerciser then stands adjacent to the lift apparatus **22** to perform an exercise fairly known as squats whereby the lift apparatus **22** is pulled in a downward position, or may perform a standing military press, whereby the lift apparatus **22** is moved in an upward position.

Referring now to FIGS. **35** and **36**, with the bench **18** positioned on track **20** away from the lift apparatus **22**, the exerciser may face away from the lift apparatus **22** to perform an exercise known as tricep extension or dips, and rowing, or may face the lift apparatus **22** to perform an exercise generally known as curls, whereby the lift apparatus **22** is raised from a downwardly extended arm position to a bent elbow chest height position.

Referring now to FIGS. **37** and **38**, exercise is generally known as tricep extensions or dips and rowing, respectively, and performed by positioning the bench **18** to face away from the lift apparatus **22**, adjusting the angle of the lift apparatus **22** in relation to the apertured arc member **60**, and by adjusting the incline of the back **142** of the bench **18** to accomplish the desired exercise.

Referring now to FIG. **39**, an exercise generally known as butterflies may be performed using the weight lifting machine **250**, as well as an exercise known as leg extensions using the lift member **334**. Leg extensions and leg curls may also be performed using the attachable second lift apparatus **200** by positioning the bench **18** such that the adjustable frame **224** extends downwardly in front of the seat **140** of the bench **18**. The padded roll **238** is mounted in one of the apertures **234** in the adjustable frame **224** such that extension of the exerciser's legs outwardly from the bench **18** pivots the adjustable frame **224**, thereby pivoting the shaft **206**, in turn rotating the wheel member **204** to draw the lift cable **44** over the wheel member **204** thereby lifting the plates **40** from the weight stack **36**. The lift apparatus **200** may also be used to perform any variety of lifting exercises using the bars **236** and **240**, as well as to perform exercises generally known as crunches and illustrated in FIGS. **40** and **41** using the padded roll **238**. Thus, as illustrated, a variety of exercises may be performed to conduct a total body workout on the weight lifting machines **10** and **250** utilizing a single lift cable **44** and a single weight stack **36** to accomplish all of the exercises while maintaining consistent resistance on the single lift cable **44**.

Although preferred embodiments of the present invention have been illustrated in the accompanying Drawings and described in the foregoing Detailed Description, it is to be understood that the same is by way of illustration and example only and is not to be taken by way of limitation, the spirit and scope of the invention being limited only to the terms of the appended claims.

I claim:

1. A weight lifting machine, comprising:

a support frame;

an adjustable weight stack having a multiplicity of separate plates mounted on the support frame for vertical movement of a selected number of plates;

first lift means pivotally attached to the support frame for pivotal movement in a first direction and a second opposite direction;

a first member mounted to the support frame for movement in the first direction;

a first pulley rotatably mounted to the first member;

a second member mounted to the support frame for movement in the second opposite direction;

a second pulley rotatably mounted to the second member;

a first lift cable having a first end connected to the weight stack and a second fixed end, the first lift cable threaded around the first and second pulleys;

means for moving the first member in the first direction in response to movement of the first lift means in the first direction and for moving the second member in the second opposite direction in response to movement of the first lift means in the second opposite direction;

means for preventing movement of the first member in the second opposite direction when the second member is moved in the second opposite direction in response to movement of the first lift means in the second opposite direction;

means for preventing movement of the second member in the first direction when the first member is moved in the first direction in response to movement of the first lift means in the first direction; and

movement of either the first member or the second member lengthening the distance between the first and second pulleys and thereby actuating the first lift cable to lift the selected number of plates.

2. The weight lifting machine of claim **1**, further comprising a bench vertically adjustable and slidably mounted on the support frame for horizontal movement beneath the first lift means.

3. The weight lifting machine of claim **2**, wherein the bench further comprises a seat portion and a back portion with the back portion being angularly adjustable.

4. The weight lifting machine of claim **3**, wherein the bench seat portion is rotatably mounted for adjustable positioning about a vertically extending axis.

5. The weight lifting machine of claim **1**, further including angular adjustment means whereby the first lift means is angularly adjustable upwardly and downwardly from a substantially horizontally extending position.

6. The weight lifting machine of claim **1**, further comprising:

a second lift means pivotally attached to the support frame;

a third pulley through which the first lift cable is threaded;

a fourth pulley;

means for connecting the third pulley to the fourth pulley to translate the third pulley in response to translation of the fourth pulley, the translation of the third pulley actuating the first lift cable to lift the selected number of plates; and

a second lift cable having at least one end connected to the second lift means, the second lift cable threaded around the fourth pulley, movement of the second lift means pulling the second lift cable and causing translation of the fourth pulley.

7. The weight lifting machine of claim **6**, further comprising a third lift means pivotally attached to the support frame for connection of the second end of the first lift cable to the third lift means, movement of the third lift means actuating the first lift cable to lift the selected number of plates.

8. The weight lifting machine of claim **1**, wherein the first lift means further comprises means for adjustably positioning the lift angle of the first lift means through an arcuate range of connection points.

9. The weight lifting machine of claim **1**, wherein the first direction is upward and the second opposite direction is downward.

10. The weight lifting machine of claim **1**, wherein the first lift cable is threaded around the first and second pulleys such that pulling an end of the first lift cable causes the first pulley to rotate in a direction opposite from a direction of rotation of the second pulley.

11. The weight lifting machine of claim **1**, wherein the means for moving the first and second members comprises:

a third member mounted to the support frame for movement in the first direction and the second opposite direction;

means for connecting the first lift means to the third member;

a first wheel mounted to the third member and positioned adjacent to the first member to move the first member in the first direction in response to movement of the first lift means in a first direction; and

a second wheel mounted to the third member and positioned adjacent to the second member to move the second member in the second opposite direc-

tion in response to movement of the first lift means in a second opposite direction.

12. The weight lifting machine of claim **1**, wherein the means for moving the first and second members comprises:

a third member mounted to the support frame for movement in the first direction and the second opposite direction;

means for connecting the first lift means to the third member;

a first tab mounted to the first member and positioned adjacent to the third member to move the first member in the first direction in response to movement of the first lift means in the first direction; and

a second tab mounted to the second member and positioned adjacent to the third member to move the second member in the second opposite direction in response to movement of the first lift means in the second opposite direction.

13. The weight lifting machine of claim **1**, wherein the means for moving the first and second members comprises:

a third member mounted to the support frame for movement in the first direction and the second opposite direction;

means for connecting the first lift means to the third member; and

a wheel mounted to the third member and positioned adjacent to the first and second members to move the first member in the first direction in response to movement of the first lift means in the first direction and to move the second member in the second opposite direction in response to movement of the first lift means in the second opposite direction.

14. The weight lifting machine of claim **1**, wherein the means for preventing movement of the first and second members comprises:

a first restraining line having a first end connected to the support frame and having a second end connected to the first member to prevent movement of the first member in the second opposite direction; and

a second restraining line having a first end connected to the support frame and having a second end connected to the second member to prevent movement of the second member in the first direction.

15. The weight lifting machine of claim **1**, wherein the means for preventing movement of the first and second members comprises:

a bar having an end fixed to the support frame;

a first stop mounted to the bar to prevent movement of the first member in the second opposite direction; and

a second stop mounted to the bar to prevent movement of the second member in the first direction.

16. An exercise apparatus comprising:

a press bar;

means for supporting the press bar for movement upwardly and downwardly;

an actuating bar;

means for connecting the actuating bar to the press bar for movement therewith;

means for selectively varying the positioning of the actuating bar relative to the press bar;

first and second pulleys mounted above and below the actuating bar, respectively;

means for moving the first pulley upwardly with the actuating bar when the press bar is moved upwardly;

means for moving the second pulley downwardly with the actuating bar when the press bar is moved downwardly;

means for limiting downward movement of the first pulley when the second pulley is moved downwardly;

means for limiting upward movement of the second pulley when the first pulley is moved upwardly;

a continuous cable trained around the first and second pulleys;

means for securing one end of the cable against movement, and resistance means connected to the other end of the cable for resisting movement of the press bar.

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